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CONTENTS

DIESEL RAILWAY TRACTION

A Supplement illustrating and describing developments in Diesel Railway Traction is presented with each copy of this week's issue.

Transport in Germany

GERMANY, which has roughly twice the area of Great Britain and Northern Ireland, has about 1½ times the population. The latter is unevenly divided, the principal industrial areas being the Ruhr, Berlin, Saxony, Northern Bavaria, and Upper Silesia, while East Prussia is chiefly agricultural, with a much less dense population. The inland transport system of Germany in order of importance consists of the railways, inland waterways, road transport, and air services. The railways still convey over 75 per cent. of the goods traffic, and 90 per cent. of the passenger traffic of the country. Many important works have been and are being undertaken for the improvement and development of canals in Germany, and the whole of the northern part of the country consists of one vast plain traversed by three notable waterways, the Rhine, Elbe, and Oder, which are or shortly will be interconnected by an important system of canals. In the south the navigable Danube affords Germany access by water to and from the Black Sea. Long distance road transport involves fewer vehicles than might be expected, as, apart from trailers and furniture vans, the total is only about 10,000. It is clearly the intention of German transport policy not to allow unrestricted competition between road and railway, but, in the words of Herr Königs, to enable motor transport "not only to provide such transport as is intrinsically remunerative on a purely commercial basis. but also in common with the Reichsbahn to serve thinly populated areas better than hitherto, and provide transport where there is no economic justification for railway communication." Competition is restricted by equalisation of road and rail routes. The whole subject of inland transport co-ordination was considered on Tuesday last by Brig.-General Sir H. Osborne Mance in a paper to the Institute of Transport, and he expressed the view that in the long run the only workable system of road and rail co-ordination in fully developed countries will be found to be one involving common financial interest, with such safeguards as may be evolved to ensure that transport is operated with a wider outlook than that of any sectional interest.

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The Week's Traffics

The traffic returns of the four main line railways for the past week are the best so far this year and the Southern is now on the right side for the six weeks, and the L.N.E.R. has substantially reduced its previous decrease. In the corresponding week of 1936 the L.N.E.R. had an increase of £8,000 in merchandise receipts, and the coal traffics showed little change, so that last week's coal returns are generally satisfactory. Passenger train traffics for the week are good and compare with slight changes a year ago. Merchandise receipts to date are £88,000 up on the L.M.S.R., £33,000 up on the Great Western, and £6,000 up on the L.N.E.R. The principal increase in passenger train traffics is that of £59,000 on the Southern, followed by increases of £35,000, £27,000, and £6,000, respectively, on the L.M.S.R., L.N.E.R., and Great Western.

	6th Week				Year to date	
	Pass., &c.	Goods, &c.	Coal, &c.	Total	Inc. or Dec.	
	£	£	£	£	£	%
L.M.S.R. ..	+ 17,000	+ 12,000	+ 16,000	+ 45,000	+ 76,000	+ 1·14
L.N.E.R. ..	+ 10,000	—	+ 12,000	+ 22,000	— 38,000	— 0·76
G.W.R. ..	+ 8,000	+ 10,000	+ 12,000	+ 30,000	+ 34,000	+ 1·25
S.R.	+ 21,000	— 1,500	— 1,500	+ 18,000	+ 12,000	+ 0·60

London Transport receipts for the week are £32,600 up, and the increase for the 32 weeks of the current financial year is £523,800.

* * * *

The Bouts-Tillotson Appeal

A test case of great importance no less for the general public than for the interests immediately concerned was decided on Monday by the Appeal Tribunal set up under the Road and Rail Traffic Act of 1933. The appeal had been lodged by the G.W.R., L.M.S.R., L.N.E.R., and S.R. against the award of licences by Mr Gleeson Robinson, the Metropolitan Licensing Authority, to Bouts-Tillotson Transport Limited, in respect of 128 motor vehicles and 42 trailers, and the objection of the four main-line railways was in respect of vehicles used on trunk road services. In delivering judgment, Mr. Rowand Harker, K.C., Chairman of the Appeal Tribunal, said that these appeals were presented as test cases, and it appeared that the railway companies sought to test whether or not it was in the public interest that all, or substantially all, road transport services on trunk routes in England, Scotland, and Wales, should be eliminated, thereby giving the railways a monopoly, except in exceptional circumstances, of all traffic on those routes. He concluded that

it was no part of the tribunal's function to decide such a question, and found nothing in the statute which could be interpreted as empowering the licensing authority to delimit the respective functions of road and rail in the carriage of goods. In a news article on page 338 we summarise the judgment of the tribunal, whose decision in this matter is final.

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Mersey Railway

Steady progress continues to be made by this company which resumed payment of dividends on the ordinary stock in 1927 and has maintained them ever since. In 1936 it carried 15,443,813 ordinary passengers for £181,665, representing increases of 598,677 and £5,349, respectively, and took £26,989, against £26,441, from season tickets. The revenue of £7,229 from parcels, &c., and parcels post was, however, lower by £425. A reduction from 59·50 per cent. to 58·81 per cent. has been effected in the operating ratio. Capital expenditure during the year on 10 coaching vehicles amounted to £17,792.

	1936	1935	1934
	£	£	£
Gross receipts	217,012	211,552	213,814
Expenditure	127,640	125,896	128,174
Net receipts	89,372	85,656	85,640
Net revenue	89,049	85,955	86,047
Deb. and pref. payments ..	75,615	75,615	75,615
Ordinary dividend	12,357	10,592	10,592
Carried forward	2,167	2,090	3,342

The dividend on the ordinary stock is $\frac{7}{8}$ per cent., compared with $\frac{3}{4}$ per cent. for 1935 and 1934, and a sum of £1,000 has again been appropriated to reserve.

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Belfast and County Down Railway

An increase in 1936 of £2,015 in railway gross receipts was accompanied by a reduction of £206 in railway expenses, so that railway net receipts (£4,703) showed an improvement of £2,221. Net receipts from ancillary businesses, were, however, lower by £3,565. Road services, which were taken over by the Road Transport Board in October, 1935, yielded a profit of £2,777 to the company in that year, and the net receipts of £4,094 from hotels and refreshment rooms in 1936 were £788 lower. The increase in miscellaneous receipts is mainly accounted for by a new item of £1,003 for interest on Northern Ireland Road Transport Board stocks. The general financial position is compared in the accompanying table:—

	1936	1935	1934
	£	£	£
Gross receipts from businesses	183,117	198,391	200,628
Net receipts from businesses	8,797	10,142	10,487
Miscellaneous receipts, net	6,668	5,650	5,719
Total net income	15,466	15,792	16,206
Prior charges	13,940	13,972	13,929
Dividends on baronial guaranteed shares and 4½ per cent. preference stock ..	1,635	1,635	1,635
Brought forward	1,877	1,692	1,050
Carried forward	1,767	1,877	1,692

Sufficient profits were made during the second half of 1936 to meet the interest on the 4½ per cent. preference stock for that period, but results for the year do not permit of dividends on either the 5 per cent. or 4 per cent. preference stocks. During the year ten goods wagons have been built as replacements to stock.

* * * *

Cheaper Fares and Better Service

Among the railway problems mentioned by Mr. George Mills, Divisional General Manager, Scottish Area, L.N.E.R., in a recent lecture to the Dunfermline Chamber of Commerce, was the taking of decisions as to how far fares can be reduced with the prospect of adequate compensation from new traffic. Mr. Mills chose the parallel of a Chancellor of the Exchequer wrestling with his desire to take the tax off beer; but a well-known axiom states that there is no such thing as bad beer, nor has a satisfactory substitute for the beverage yet been discovered. There may quite well be bad railway service, on the other hand, while this means of transport is notoriously open to competition. Cheapness must therefore be accompanied by improvement of service if the demand is to be maintained, and a point in this direction to which Mr. Mills attached paramount importance was punctuality. As an example of how the effects of minor mishaps are felt far beyond their place of origin, he mentioned the derailment of a parcel van during shunting at Edinburgh, Waverley. No fewer than 50 trains suffered delay varying from 4 to 35 minutes, involving an aggregate loss of 814 minutes. In addition, three local trains were suspended. Such dislocation lends point to Mr. Mills' remark that unpunctuality is the unforgiveable sin in the transport world.

* * * *

L.P.T.B. New Rolling Stock Record Order

The contract recorded on page 342 is the largest single order for railway rolling stock so far given by the London Passenger Transport Board or its former constituent companies. Of the total of 401 vehicles, 25 are motor and 222 trailer cars for District Line service and 106 motor cars and 48 trailer cars for the Metropolitan Line. The cost involved considerably exceeds £1,000,000. They will replace what still remains in service of the original electric stock, and will provide a more efficient and uniform pattern which can be interworked with the latest types at work on the board's system. The design of the coaches forming this latest order provides for air-operated doors and electro-pneumatic brakes, both innovations so far as the District and Metropolitan Lines are concerned. At Acton, the board will carry out improvements concurrently to existing District and Metropolitan stock of post-war construction. It will be recalled that the board recently placed orders, valued at a total of nearly £700,000 for 116 new motor cars with air-worked doors, Metadyne control and electro-pneumatic brakes to replace Hammersmith and City Line stock. The newest cars are to be modifications of these. A description of a new train on the Hammersmith & City Line was given in our *Electric Railway Traction Supplement* for July 24, 1936.

* * * *

British Travel Films

An important step has just been made to facilitate the circulation in different parts of the world of British "documentary" films, which show various attractions the British Isles offer to the foreign visitor. The wide circulation of such films, on which the commercial returns are usually very small, has been handicapped hitherto by customs duties, but, so far as the British Empire is concerned, this has now been removed by the granting of Board of Education certificates permitting films produced by the Travel and Industrial Development Association and the G.P.O. Film Unit, to be admitted free of customs duty into all parts of the British Empire. T.I.D.A. films included are "So This is London," "So This is Lancashire," "Heart of an Empire," "For All Eternity" (showing the English cathedrals), "The Key to Scotland," and "Beside the Seaside"; while G.P.O. Unit films comprise "Industrial Britain" and "Night Mail" (a trip on the postal special from Euston to Aberdeen). A much larger movement has been initiated by the League of Nations, whereby a certificate awarded by the International Film Institute at Rome will obviate the payment of customs duties in many

foreign countries, and an application for this privilege has been made for the T.I.D.A. and G.P.O. Unit films.

* * * *

French Locomotive Efficiency

In response to inquiries for information about coal and water consumption on the remarkable run described in THE RAILWAY GAZETTE of January 22, when one of the rebuilt Chapelon Pacifics of the P.O.-Midi Railway hauled a 397-ton train non-stop over the 216·7 miles from Bordeaux to St. Pierre des Corps at an average speed of 72·2 m.p.h., we are now able to say that coal consumption averaged 44¾ lb. per mile and water 335 lb., both remarkable figures for the performance. The evaporation rate thus was 7·53 lb. of water per lb. of coal fired. Inclusive of getting the engine ready and lighting up, the total consumption of coal was approximately 10,470 lb. (4,750 kg.). If that required for getting ready, estimated at 772 lb. (350 kg.) is deducted (a fairly exact figure according to numerous measurements over a long period made by the P.O.-Midi locomotive running department), then the consumption for the actual run works out at approximately 9,700 lb. (4,400 kg.), and this produces the figure already given of 44¾ lb. per mile (12·55 kg. per km.), and gives a firing rate of 66 lb. per sq. ft. of grate area an hour. The gross consumption of water was 7,260 gallons (33 cu. m.), that is, within the capacity of the tender, for there are no water troughs between St. Pierre and Bordeaux. These figures confirm the extraordinarily successful results both in performance and in economy achieved by the application of M. Chapelon's principles, to locomotives not only on the P.O.-Midi but also on the Est and Nord systems.

* * * *

A "Blind Spot"

Although several causes combined to bring about the collision between an L.N.E.R. train and a motorcar at Harpham crossing on November 15, 1936, the carelessness of the motorist was the immediate one. Col. Trench, a summary of whose report appears on page 335, attributes his action to a momentary mental "blind spot," or forgetfulness of what he was doing. Undoubtedly the breaking of the gate lock by some unknown person led to the driver and his passenger being tempted to pass on to the line; nevertheless no real care was exercised by them in doing so. Col. Trench considers that gates of public road crossings, where no signalling exists, should be locked against road users, to ensure the calling of the responsible railway staff to open them, and further suggests that the conditions at many crossings should be reviewed with a view to the installation of improved equipment as renewals fall due. It is certainly very necessary to make clear which are occupation crossings and which are not. The growth of motor traffic has made a great change in the whole position, and a crossing with no signals, and no control over any in the vicinity, with gates that can be opened by road users, constitutes a flat contradiction to the fundamental principles of safe working.

* * * *

Signalling in Alsace-Lorraine

On page 321 will be found a description of an interesting signalling concentration at Lutterbach on the main Strasbourg-Basle line of the Alsace-Lorraine Railways, in which a route-lever apparatus, similar to that seen on some of the other French lines, has been used to bring the whole of the working into the hands of the station supervisor. Slight modifications have also been made to allow of the points being worked individually for shunting movements without signal, in acordance with the German system, still largely retained on these railways, which have been French, German and then French once more in the space of 50 years. In 1871, although there was neither much double line nor much traffic, the introduction of German operating rules was not effected without some difficulty, according to official accounts. During the 40 odd years that German management continued, the railways in Alsace-Lorraine were greatly extended, and the industrial development of the territory resulted in an enormous increase of traffic. An excellent signal system was everywhere installed. To make any appreciable change would entail great expense and bring no compensating advantage of much value. A scheme for harmonising the signal aspects with those laid down in the 1930 *Code des Signaux* has been worked out, but has not been adopted at Lutterbach for the present, whatever future intentions may be.

* * * *

A Feedwater Heater Problem

Discussing in the columns of our American contemporary, the *Railway Age*, the question of the availability of locomotive feedwater heaters, Mr. L. F. Wilson pointed out that a feedwater heater, to justify its use, must depend upon the recovery of the otherwise wasted heat units of the exhaust steam. Since, however, there are many demands upon the locomotive boiler for steam other than supplying the main cylinders, the only way possible to make constant the replacement of evaporative water is to store the necessary recovered exhaust steam heat units while the locomotive is working, for use in heating the feedwater required while the engine is not working steam through the main cylinders. It is well known that in many classes of service, the demand for steam from a locomotive boiler does not cease when the regulator is closed. It is required, in passenger service, for air conditioning, train heating, and air compression, whilst in freight service steam is also wanted for some of these purposes and, in addition, for refrigeration. It has been variously estimated that the earlier conventional types of feedwater heaters are available for only 60 to 80 per cent. of the boiler feedwater requirements. The live steam injector is, of course, always there to make up deficiences, but if money is to be invested on a large scale for feedwater heating equipment in order to save, by the recovery of exhaust steam heat, a percentage of 10 to 12 per cent. measured in fuel, it is obvious that this overall economy can be secured only if the feedwater heater is constantly available.

* * * *

Claims Prevention

Detractors of our island people (among whom are numbered some of our own enigmatic island persons) claim that we are lethargic of conscience and deficient in the nobler aspirations of humanity. In railway goods departments, however, our native ardour is more in evidence, so much so that breakable objects have been known to suffer from the almost passionate gusto of those who handle them. How, then, to quench the dangerous flames of zeal, and yet not shrivel with an unkind word the temperamental spark that feeds them? The Great Western Railway shows the way with its claims prevention posters, a new series of which we begin to reproduce in our Scrap Heap page this week. This series being the third, it seems that the recipe of homely images and intimate associations exemplified in the posters we reproduced between July 24 and October 9 last year has been successful, and the mixture is being repeated as before. We hope that the new set may continue its useful work of saving Great Western customers from disappointment; the company from claims for compensation; and the staff from the tortures of remorse.

Profit Sharing Proposals

THE recent decision of the Railway Staff National Tribunal against the sweeping claims put forward by the Associated Society of Locomotive Engineers and Firemen provides an occasion for Mr. Ashley Brown, the General Secretary of the British Railway Stockholders Union Limited, to fly a kite on the intriguing, albeit not novel, idea of the extension of the co-partnership principle to the railway industry. Mr. Brown, in an article in the current issue of *The Railway Stockholder*, briefly reviews the net revenue position during the past few years and then goes on to declare that what is "intensely significant is that the moment the return of the last farthing of the wage deduction becomes a certainty . . . labour flings aside all pretence of regarding wage deductions as a maximum demand and boldly formulates proposals which, if they are granted, will involve the companies in an increased annual expenditure of from £30,000,000 to £50,000,000." Mr. Brown appears to be a realist for he says "we must face the fact that labour will force upon the companies, with steadily increasing insistence, all these demands and others, and that, as I have said, a mere refusal is no solution to the problem which they represent." He believes that the "one and only solution" lies in admitting the employees to a share in the profits of the industry. Linked with this suggestion is another, namely, that the offer of a reasonable interest in the profits of the industry must be contingent upon the certainty of peace within the industry for a stated period.

Reduced to its simplest form, Mr. Brown's proposal seems to be that, if railwaymen know that "of every pound of net revenue they themselves will take an allotted proportion," they will lose any desire to strike or talk of strikes. In order to explore the question Mr. Brown thinks that the companies should call into being a small committee consisting of representatives of the men's unions and the stockholders, with the assistance "of a few knowledgable railway officials," the duties of such a committee to be confined to making recommendations. It may here be recalled that the trade unions in support of their claims before the Railway Staff National Tribunal have contended "that the first charge on the industry must be satisfactory salaries and wages and conditions of service for those engaged therein," while the reply of the railway companies on this point has been that "the payment of salaries and wages is admittedly a first charge on the railway companies' current revenues, from which the salaries and wages bill already absorbs a very high proportion."

As we have indicated, the proposal to introduce co-partnership methods into the railway industry is not new.* The idea has indeed been presented on previous occasions, but has not progressed beyond the stage of something akin to academic discussion. It is true that certain profit-sharing devices have met with some success, in other industries—notably the gas industry—but there would seem to be insuperable difficulties in the way of the adoption of a workable scheme on the British railways. The immensity of the undertakings alone constitutes a real difficulty. Then, the scheme would have to apply to all railway employees of all grades. The well-established principle of national agreements covering the four systems could not be abandoned; thus, it may be assumed all employees would have to be included in the scheme. Further, to carry the process to a logical conclusion, it would require that the employees would be entitled to a share in the control of the railways. For this to be effective they would, presumably, have to be given representation on the directorates. Moreover, we foresee other difficulties—both political and economic—while the differing organisation and policies of the trade unions, too, would seem to indicate the probability of definite obstacles arising. *The Railway News* scheme of 1911 for co-partnership or profit sharing (which is summarised on pages 332-3 of this issue) was intended to apply only to the members of the staff engaged in the movement of traffic. Put very briefly it amounted, after paying prior charges, to a division of the profit as between the ordinary stockholder and the employee. The employee would not hold any scrip, but would be paid his proportion of the "net" profit in the form of a percentage dividend on the total of his annual salary.

As to how Mr. Brown's proposals will appeal, either to the companies or to the railway trade unions, we cannot pretend to hazard too precise an opinion. The proposals may, conceivably, be considered, but we find it hard to believe that organised labour would be willing—even for a limited period—to surrender, in exchange for a few pounds' worth of scrip per man, the present unquestioned right of endeavouring to secure, as and when it may be possible, an improvement in wages and conditions of employment. We find it hard to believe, too, that the idea would commend itself to the men or the unions, even with the prospect of the workers receiving as their share of the profits, something considerably more than the present meagre level of remuneration of ordinary and preferred stocks.

We do not share Mr. Brown's pessimism regarding the future. Claims for improved wages will certainly be made in the near future and, in so far as a claim for the cessation of percentage deductions and the restoration of standard conditions of service are concerned, the statement of the tribunal when it said that "all things being equal the case for returning to the standard rates becomes stronger with time" will be well understood. As to other claims, these will be matters for decision by the tribunal, failing agreement by direct negotiations, and we do not believe that the acid test of commonsense will fail. Quite naturally the respective claims of stockholder and employee are often poles apart, but it is one of the functions of the tribunal to settle and hold a fair balance between such claims. For years wages have been depressed. With the exception of a period of but a few months the earnings of the staff have been subject to a percentage deduction for nearly nine years and, with trade recovery, the men and the unions see a chance of recovering the lost ground. That they would surrender such advantages as they already possess for the problematical yield from a block of railway stock seems, at least, unlikely.

Nevertheless, while we recognise the obvious differences in outlook, we may well ask—are the interests of the rival claimants really dissimilar? The prosperity of stockholder and employee alike is bound up in the prosperity of the industry. Loss of traffic, whether caused by unregulated road competition, or by an "economic blizzard," causes reduction or even suspension in dividends on the one hand, and the acceptance of lower wages on the other hand. So, despite the submission of such ill timed and disproportionate claims as the recent one for the establishment of a six-hour day, we believe that railwaymen, as a whole, have the welfare of their industry at heart. No one will wish to disagree with Mr. Brown when he speaks of the need of "peace within the industry," but is his language entirely pacific when he says "to

* Two articles, totalling six pages, which were published in the September 30 and October 7, 1911, issues of our constituent *The Railway News*, showed the application of a co-partnership scheme to the accounts of various British railway companies for the year 1910. These articles are summarised on pages 332–3.—ED. *R.G.*

win peace within the industry we must show labour (*a*) that we have a constructive policy which is beneficial to labour, and (*b*) that if a fight is forced upon us we are capable of taking the aggressive"? In conclusion, we feel that it cannot be doubted that co-operation within the industry is essential to its progress, but Mr. Brown has not convinced us that profit-sharing is the "one and only solution" to the problem.

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Great Western Railway

THE pleasant surprise caused by the fact that the dividend of 3 per cent. for 1936 was fully earned out of the year's profits is amply confirmed by a study of the report. In the gross receipts of £26,729,439 from the railway there was an increase of £991,126, or 3·85 per cent., and in the railway expenditure of £20,814,141 there was an advance of only £54,080, or 0·26 per cent., so that the railway net receipts of £5,915,299 showed an improvement of £937,046, or 18·82 per cent. The operating ratio was reduced from 80·66 per cent. to 77·87 per cent. Ancillary businesses as a whole brought in a profit of £7,913, whereas in 1935 there was a net loss of £7,235. Net receipts from docks, harbours, and wharves improved by £73,018, from road transport by £9,410, from steamboats by £265, and the loss on canals was reduced by £1,620. Profits from hotels, refreshment rooms, and cars were £288 less although the gross takings were £45,328 higher, and the losses on collection and delivery and on air transport increased by £67,100 and £1,777 respectively. From "J" Joint Lines the company received £220 less net, and from other miscellaneous net receipts £75,049 less entirely because of the reduction of £96,467 in general interest. Dividends from associated omnibus undertakings rose from £153,208 to £173,589, and Carter Paterson and Hay's Wharf profits from £26,455 to £30,689. Net revenue for the year was higher by £864,271, or 15·86 per cent. Results for the past three years are compared in the accompanying table:—

	1936 £	1935 £	1934 £
Total expenditure on capital account	184,695,041	184,072,637	183,685,192
Gross receipts from businesses carried on by the company	30,763,033	29,788,622	29,280,382
Revenue expenditure on ditto	24,839,821	24,817,604	24,311,381
Net receipts of ditto	5,923,212	4,971,018	4,969,001
"J" Joint Lines—company's proportion of net revenue	140,887	141,107	130,638
Miscellaneous receipts (net)	1,039,222	1,114,271	1,069,264
Miscellaneous charges	788,491	775,837	757,904
Net revenue	6,314,830	5,450,559	5,410,999
Profit on realisation of investments	—	122,990	323,948
Rates and rate relief recoverable to December 31, 1935	1,737,800	—	—
Appropriation to contingency fund	Dr. 1,737,800	—	—
Interest on loans and debenture stocks	1,649,818	1,649,811	1,649,809
Dividends on rent charge, guaranteed and preference stocks	3,344,699	3,344,699	3,344,699
Balance after payment of preference dividends	1,320,313	579,039	740,439
Dividend on ordinary stock	1,287,892	1,287,892	1,287,892
Rate per cent.	3	3	3
Surplus or deficit (+ or −)	+ 32,421	− 708,853	− 547,453
Appropriation from contingency fund	—	710,000	550,000
Balance brought forward from previous year	44,373	43,226	40,679
Balance carried forward to subsequent year	76,794	44,373	43,226

Except for a decrease of £4,135 in first class season ticket receipts there was a general improvement in passenger travel. First class ordinary receipts advanced by £35,439, or 7·68 per cent., and the £590,262 total of first class receipts represented 7·29 per cent. of the total passenger receipts, as compared with 7·15 per cent. in 1935, and 6·88 per cent. in 1934. Third class ordinary passenger receipts, apart from workmen, improved by £239,372, or 3·72 per cent., and third class season tickets brought in £7,833 more. Receipts from parcels, &c., mails and parcel post (£2,967,855) advanced by £70,597, or 2·44 per cent., in spite of a decrease of £160,340 in receipts from parcels under 2 cwt. From higher class merchandise the receipts were £7,467,038, an increase of £418,197, or 5·93 per cent., with an advance of 4.57 per cent. in the originating tonnage. Minerals and merchandise (classes 1-6) brought in £2,335,950, a gain of £107,137, or 4·81 per cent., with an increase in originating tonnage of 8·70 per cent. Coal, &c., receipts were £5,340,805, an improvement of £60,819, or 1·15 per cent., with a decrease of 3·78 per cent. in originating tonnage. Goods train receipts as a whole were £15,421,213, an increase of £627,051, or 4·24 per cent. The accompanying table shows the approximate allocation of receipts in 1936:—

	Amount £	Amount per £ s.	d.
Salaries and wages	17,050,000	11	1
Coal	1,850,000	1	2
Other material	3,200,000	2	1
Rates and sundry items, *less* miscellaneous receipts	2,400,000	1	7
	24,500,000	15	11
Interest and dividends on capital	6,250,000	4	1
	£30,750,000	20	0

In 1935 salaries and wages got 11s. 2d. in the £, whereas interest and dividends received 4s. 2d. with the aid of 7d. from reserves, &c. In train-miles there was an increase of 3·07 per cent. under coaching and of 4·24 per cent. under goods. Bearing this in mind and also the fact of increased remuneration to the staff as from August, 1936, arising from the decision of the Railway Staff National Tribunal, and the increase of £55,700 in the coal bill, the advance of £321,455 in locomotive running and traffic expenses is fully consistent with economical operation. The assessment, by agreement, of the company's undertaking for rating purposes, has enabled the payments for local rates and to the Railway Freight Rebates Fund to be reduced by £327,469 in 1936. The charge against maintenance of way and works has been reduced by £70,524. The length of track renewed was 275¼ miles, against 270¾ miles in 1935, but the route miles open have been reduced from 3,790 miles to 3,782. Renewals of locomotives were 149 in the company's shops and one by contractors, against 122 in the company's shops in 1935, and renewals of merchandise and mineral vehicles in the company's shops were 4,367, against 3,236 in 1935. For maintenance of rolling stock the sum charged in the accounts shows an increase of £43,917. A very strong financial position is disclosed in the balance sheet. Investments in Government securities have increased from £8,177,539 to £11,401,218. There is due to the company in respect of overpayments up to December 31, 1936, approximately £1,645,000 from the Railway Freight Rebates Fund and the similar funds in respect of docks and canals, and £555,000 from the local authorities, a total of £2,200,000, of which £1,738,000 is in respect of the period to December 31, 1935. This last mentioned amount has been appropriated to the contingency fund, which now stands at £3,252,679. Capital expenditure during 1936 amounted to £622,404.

Southern Railway

HAVING allowed in the 1935 accounts for the estimated reduction in the sums payable for rates in consequence of the House of Lords decision, the savings of the Southern in this direction for 1936 were naturally much smaller and amounted only to £35,753, as against £246,077 for 1935. Gross receipts from railway working in 1936 were £21,256,414, an increase of £608,737, or 2·95 per cent. In the railway working expenses of £16,474,211, there was an increase of £381,033 or 2·37 per cent., and the operating ratio was reduced from 77·94 per cent. to 77·50 per cent. Net railway receipts, at £4,782,203, were accordingly higher by £227,704, or just under 5 per cent. Net receipts from ancillary businesses as a whole were £491,119, an increase of £4,992. Although steamboat gross receipts were £18,622 up, the net receipts were £6,176 down, and the profit on docks was only £27,643 higher in spite of an increase of £100,154 in earnings. Road transport goods services earned £24,278 gross and £6,959 net, as compared with £23,263 and £6,836, respectively, in 1935, and the profit on the three hotels which the company works, namely Deal (South Eastern), Charing Cross, and Craven, was increased from £5,735 to £8,710. On air transport the loss was reduced from £8,988 to £4,348, but the profit on collection and delivery services was £24,753 lower. The share of loss on the Somerset & Dorset joint line was reduced from £41,383 to £37,345, but miscellaneous net receipts were £67,684 lower, mainly because of the drop of £57,084 in general interest. Rents from hotels, however, rose from £3,758 to £8,120, and the dividends received from the company's investment in Carter Patersons and Hay's Wharf were £30,685, against £26,451. Miscellaneous charges are £15,187 up, and net revenue shows an improvement of £153,863. Results are compared in the accompanying table:—

	1936 £	1935 £	1934 £
Total expenditure on capital account	169,144,332	167,425,314	166,064,274
Gross receipts from businesses carried on by the company	24,268,069	23,517,026	23,152,749
Revenue expenditure on ditto	18,994,747	18,476,400	18,399,375
Net receipts of ditto	5,273,322	5,040,626	4,753,374
"J" Joint Lines—company's proportion of net revenue	Dr. 37,345	Dr. 41,383	Dr. 49,432
Miscellaneous receipts (net)	1,243,225	1,310,909	1,326,479
Miscellaneous charges	253,042	237,855	230,086
Net revenue	6,226,160	6,072,297	5,800,335
Interest on loans and debenture stocks, etc.	1,943,167	1,943,167	1,943,167
Dividends on guaranteed and preference stocks	2,751,278	2,751,278	2,751,278
Balance after payment of preference dividends	1,531,715	1,377,852	1,105,890
Dividend on ordinary stocks	1,536,781	1,379,330	1,103,464
Rate per cent.:—			
Preferred ordinary	5	5	4
Deferred ordinary	½	—	—
Surplus or deficit (+ or −)	− 5,066	− 1,478	+ 2,426
Balance brought forward from previous year	225,875	227,353	224,927
Balance carried forward to subsequent year	220,809	225,875	227,353

Passenger train traffic produced £16,090,002, or £463,637 more than in 1935. Passengers brought in £13,890,113, an improvement of £502,626, or 3·75 per cent. First class ordinary and season ticket passengers produced £1,450,844, or 10·45 per cent. of the total receipts from passengers. First class ordinary receipts improved by £70,770, or 8·61 per cent., and second class boat train passengers yielded £29,992, or 10·66 per cent., more. Third class ordinary passenger receipts were higher by £236,894, or 2·88 per cent. First class season ticket receipts were up £9,501 and third class were up £94,179. In receipts from parcels, &c., mails and parcel post the net decrease of £38,989 was entirely due to the drop of £141,551 in receipts from parcels under 2 cwt. Goods train receipts amounted to £4,919,267, an increase of £136,505, or 2·85 per cent. Higher class merchandise receipts were £132,075 greater, with an increase of 182,406 in tonnage, but receipts from minerals and merchandise (Classes 1-6) were £26,170 lower. Coal class receipts were £30,525 higher.

The company charged £130,413 more to maintenance of way and works. The length of track renewed was 207¼ miles, against 169 miles in 1935. To maintenance of rolling stock £12,361 less was charged, and renewals were less. Locomotive running expenses and traffic expenses were up £130,856 and £125,254, respectively, due to the heavier traffic, the further restoration of wage and salary cuts, and the increase of £140,393 in the cost of electric current. Electric train-miles increased by 2,129,654, but steam train miles were reduced by 655,305. The electrification of the lines from Hampton Court Junction (Surbiton) to Woking, Guildford, and Portsmouth, from Woking to Alton and from Weybridge to Staines (95 route miles) is making satisfactory progress.

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Great Northern Railway (Ireland)

AN improvement of £25,945, or 2·40 per cent., in railway receipts during 1936, was accompanied by an increase of £17,422, or 1·76 per cent. in railway working expenses, and the operating ratio fell from 92·56 per cent. to 92·18 per cent. Net railway receipts (£97,680) were accordingly higher by £8,523. Road transport gave a profit of £13,345, an increase of £4,908 on that of the previous year, and the net receipts of hotels, refreshment rooms, and cars improved from £3,591 to £4,865. The accompanying table compares the general financial position for the past three years:—

	1936 £	1935 £	1934 £
Total expenditure on capital account	10,052,929	10,052,929	10,052,929
Gross receipts from businesses	1,305,845	1,312,802	1,247,912
Revenue expenditure on ditto	1,189,955	1,211,617	1,207,188
Net receipts of ditto	115,890	101,185	40,724
Proportion of compensation under Irish Railways (Settlement of Claims) Act, 1921	—	—	7,500
Miscellaneous receipts (net)	35,428	38,947	35,558
Total net income	151,318	140,132	83,782
Interest, rentals and other fixed charges	115,099	114,825	114,465
Dividend on guaranteed stock	34,771	34,771	34,771
Balance	1,448 Dr.	9,464 Dr.	65,454
Balances released from miscellaneous accounts	—	9,464	65,454
Brought forward	—	—	—
Carried forward	1,448	—	—

The report states that traffic receipts in Northern Ireland of the railway companies and of the Northern Ireland Road Transport Board are to be pooled in accordance with the requirements of the Road and Railway Transport Act (Northern Ireland), 1935, as from January 1, 1936, but as the time for submission of the pooling scheme for approval by the Transport Appeal Tribunal has been extended to July 15, 1937, by order of the Ministry of Home Affairs, no adjustment has been made in the railway traffic receipts in respect of the pool. The Northern Ireland Road Transport Board has begun taking over the road lorry services operating in the areas served by the company in Northern Ireland. In the Irish Free State the company has almost completed the taking over of

the road merchandise services authorised to be acquired by it under the Free State Road Transport Act, 1933. The improvement of £11,186 in total net income is unfortunately not sufficient to permit of any dividends on the preference and ordinary stocks, which have not received anything since 1931. A reduction of 8 miles 50 chains is shown in the route mileage statement, which seems to mean the complete closing of the Goraghwood—Markethill section. Passenger services on this section were withdrawn in February, 1933.

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London Midland and Scottish Railway

A THOROUGHLY healthy financial position is disclosed in the accounts for the year 1936 of this company, which has secured a net revenue of £14,048,176, the best since the £17,175,283 for 1929. Gross receipts from railway working amounted to £64,462,842, an increase of £2,804,672, or 4·55 per cent. Railway expenditure rose by £1,689,537, or 3·41 per cent., to £51,211,001 and the operating ratio fell from 80·32 per cent. to 79·44 per cent. Net railway receipts, at £13,251,841, were therefore higher by £1,115,135. From ancillary businesses the profits were £307,690, an increase of £32,786 on 1935. In road transport there was an improvement of £7,930, steamboats brought in £32,187 more, and the profit on hotels, refreshment rooms, and cars was £9,255 greater. On the other hand, docks, harbours, and wharves earned £2,006 less profits, and the loss on collection and delivery was £11,652 greater. Air transport gave an increase of £8,230 in receipts, but the loss on working was £606 higher. Net revenue from "J" Joint lines improved by £36,282. Miscellaneous net receipts were £132,567 lower, chiefly on account of the falls of £98,812 in general interest and of £82,416 in rents from houses and lands. Dividends from omnibus undertakings advanced, however, from £242,786 to £260,947, the income from the Carter Paterson and Hay's Wharf undertakings from £26,466 to £30,700, and from Joseph Nall & Co. Ltd. and Wordie & Co. Ltd. from £7,439 to £9,049. From David MacBrayne Limited the income was £7,029, against £6,875. The loss of £16,506 in 1935 on the Northern Counties Railway (Ireland) has been changed in 1936 to a profit of £9,882.

	1936 £	1935 £	1934 £
Total expenditure on capital account	454,444,204	452,843,092	452,554,778
Gross receipts from businesses carried on by the company	72,718,669	69,455,245	68,180,325
Revenue expenditure on businesses carried on by the company	59,159,138	57,043,635	56,924,562
Net receipts of business carried on by the company	13,559,531	12,411,610	11,255,763
"J." Joint Lines—company's proportion of Net Revenue	104,596	68,314	57,306
Miscellaneous receipts (net)	2,158,438	2,291,005	2,331,358
Miscellaneous charges	1,774,389	1,743,404	1,723,191
Net revenue	14,048,176	13,027,525	11,921,236
Rates and rate relief recoverable, years 1931–1934	3,180,000	—	—
Appropriation to contingency fund	3,180,000	—	—
Interest on debenture stocks	4,439,170	4,439,170	4,439,170
Dividends on guaranteed and preference stocks	8,474,383	8,474,383	7,521,201
Balance after payment of preference dividends	1,134,623	113,972	Dr. 39,135
Dividend on ordinary stock	1,190,031	—	—
Rate per cent.	1¼	Nil	Nil
Surplus (+), or deficit (−)	− 55,408	+ 113,972	− 39,135
Balance brought forward from previous year	134,491	20,519	59,654
Balance carried forward to subsequent year	79,083	134,491	20,519

Receipts from railway passengers in 1936 totalled £19,421,208, an increase of £758,550, or 4·06 per cent. First class ordinary passengers brought in £1,312,519, an increase of £149,634, or 12·87 per cent., and although there was a decrease of £22,990 in first class season ticket revenue, the aggregate first class receipts of £1,815,054 represented 9·80 per cent. of the total receipts from passengers. Third class ordinary receipts were £14,648,329, an increase of £568,917, or 4·05 per cent. Parcels, mails, &c., brought in £62,267 more net. Receipts from higher class merchandise were £18,373,763, an increase of £859,417, or 4·9 per cent. Minerals and merchandise (Classes 1—6) brought in £6,066,728, an improvement of £568,570, or 10·34 per cent. From coal class traffic the revenue was £12,779,764, an advance of £451,889, or 3·67 per cent., and the live stock receipts of £630,853 showed an improvement of £52,580, or 9·09 per cent. Total goods train traffic receipts were £37,850,108, an increase of £1,932,456, or 5·38 per cent.

The increase of £2,115,503 in the expenses of the railway and ancillary services reflects the further restoration of wages deductions, and the increased employment due to the greater volume of traffic. The increase in the salaries and wages bill for the full year amounted approximately to £1,000,000. In addition the rise in prices of raw materials has increased the expenditure, although the effect of this was mitigated by the use of materials supplied under earlier contracts. Engine miles run were 229,915,734, an increase of 8,088,747, and the total engine hours were 26,163,704, against 24,526,412. In locomotive running expenses there was an increase of £624,991. Enginemen's wages increased by £339,220, and locomotive coal cost £278,832 more. Traffic expenses advanced by £505,946, of which increase salaries and wages directly accounted for £418,220. Route miles in operation at the end of 1936 were 6,891¼, compared with 6,912¼ at the end of 1935. The amount charged to maintenance of way and works was £279,014 more, and the length of track renewed was 583 miles, against 534¼ miles in 1935. To maintenance of rolling stock an additional £259,853 was charged. A saving of approximately £900,000 per annum in rates and payments into the Railway Freight Rebates Fund has been realised by the revised valuation of the company's property in England and Wales. Credit to the extent of £885,000 was taken for this in the 1935 accounts, and the comparative reduction in this respect for 1936 amounts only to £98,195.

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Co-ordination of Transport in East Africa

BRIGADIER-GENERAL SIR H. OSBORNE MANCE, who, as recorded in our issue of July 10 last, then proceeded to East Africa to enquire into problems of co-ordination of various forms of transport in Kenya, Uganda, and Tanganyika, has now completed his report, and it has been issued as a Government paper*. The first important point that emerges is that thanks mainly to the long average haul of most traffic, amounting to 388 miles in Kenya and Uganda, and to 222 miles in Tanganyika, the railways are able to carry goods at rates, which, even in the least favourable conditions obtaining (in Tanganyika) are less than 60 per cent. of the minimum average cost likely to be attainable by road lorry transport in East Africa, even under favourable conditions. On this

* Government Printer, Nairobi, Kenya. Price 1s. Copies are on sale in London at the office of the Crown Agents for the Colonies, Millbank, S.W.1.

ground alone, therefore, the railways generally must be maintained as the principal means of transport in the three territories. The question of the possible redundancy of branch lines is not, however, so easily dealt with, but, though each must be considered on its merits, it is safe to say that the total tonnage of a branch would have to be very low and its overhead costs very high for road transport charges to be less than that of the branch, especially as the branch line loan charges would have to be met in any case, and diversion of traffic to the road would entail fresh loan charges for the improvement of the latter. The report therefore concludes that the majority of branch lines probably provide the cheapest form of transport in their areas, and, even if their retention results in a loss to the railway, necessitating a subsidy from the Government to compensate for such loss, this subsidy would be less than the corresponding subsidy to the road. In such cases, General Mance considers, the branch line should be protected as far as possible against the loss of high-rated traffic, a very important matter. On the other hand, there are some branch lines carrying to the main line only small tonnages of commodities that could stand road charges, and here dismantling of the branch line might prove a saving to the Government, including the railway, even if the users had to be subsidised temporarily in specially hard cases.

Turning to road and rail competition, the writer of the report considers that passenger competition may be neglected, as passengers form so small a percentage of the railway traffics. Of the Kenya & Uganda goods traffic, 85 per cent. is imports or exports, and to compete in world markets the latter have to be carried at unremunerative rates, for which compensation is secured by raising the rates on imports. With a monopoly such practice is inevitable and advantageous to all, and if it came to an end the subsidy would have to be collected in some other way, which might be less satisfactory. Sir Osborne proceeds to discuss the effect of unrestricted competition, which could result only in temporary gain to the road haulier until such time as he, too, was ruined by cut-throat competition for the diminishing traffic, a state of affairs generally agreed to be disastrous. Nor is the existing system of protection for higher-rated traffic from road competition practicable as it lacks flexibility and should be replaced by something more suitable. Division of function on the basis of cost to the community should be primarily determined by out-of-pocket costs of working, and an automatic division of traffic could be secured by a combined monopoly of rail and road transport, but the difficulty of this system arises from the treatment of the ancillary road user. So, though it would maintain the present rate structure, this solution of the problem is quite unsuited to East African conditions. Another solution, tolls, has already been found impracticable in Tanganyika.

The solution recommended is, therefore, a continuation of the present policy of protecting the railway monopoly, modified by elements from the other suggested solutions to impart flexibility, and permit of gradual adaptation to changing conditions. Rates should be evened out so that higher class rates may compare more favourably with road charges, but export rates should not be raised correspondingly, though some adjustment of the customs charges might be made to compensate for reductions in railway rates. Simultaneously, it is essential that licensing control should be rigidly instituted and applied to all forms of transport. Turning to air services, a monopoly of these in East Africa, with railway participation, is recommended. With regard to road improvement, the report suggests that real all-weather main roads for moderate-sized vehicles should first be dealt with, and that the improvement of trunk roads to carry heavy motor traffic should only be carried out later; also, feeder roads should have priority over roads parallel to railways. General Mance recommends the appointment of a Transport Commission consisting of five independent members for each territory, preferably one a lawyer; one representative each of European and Indian interests; one official member to watch native interests; and one member with a general economic outlook, such as a banker. For inter-territorial co-ordination there should be an Advisory Transport Committee, composed of two representatives of each of the Transport Commissions, and a part-time Secretary. The report concludes with suggestions for the division of traffic from the Moshi area between Mombasa and Dar es Salaam with a financial pool.

LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

Railway Carriage Pictures

Photochrom Co. Ltd.,
Graphic Works, Royal Tunbridge Wells.
February 12

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—In the editorial on railway carriage pictures in your issue of February 5 the disadvantage of the photograph is referred to. This has been a subject for discussion since photography was invented. "Lens versus brush" was debated on the SS. *Voltaire* on the Advertising Convention Cruise last year, and after good things had been said by many experts on both sides the subject was left much as we started.

As regards carriage mounts for railway coaches, there are more points at issue than in general publicity where it is more a matter of individual taste. In the article mentioned, reference is made to the greater opportunity the artist has to capture points which elude the photographer and to leave out features which date the picture. The skilled camera man, however, is also an artist working with the knowledge of what is required for railway photos and who can understand those points at least as well as his comrade with the brush or pencil. As to the claims of one or the other, it has to be considered whether the pictures are for advertising or only for the decoration of the coaches, and a judicious combination of the two can be secured pleasing to the eye.

If I may mention that I have been responsible for the production of carriage pictures for over a score of railways before the amalgamations and larger numbers since, it has given me some experience of what makes a successful picture; but speaking as a travel publisher with due regard for the uncertainties of public choice, it has been proved on a comparison of sales over thousands of pictures of scenery and architecture that the photograph has the larger claim on public interest. It is because members of the public want their pictures to show the places as they see them. If considered on commercial grounds, photographic work allows a much wider range of views. For mechanical reproduction of etchings or other original works larger quantities of a subject are required. Figured on per hundred pounds spent, a much wider range of pictures can be used in photography, and at a lower price than from hand drawn work, and commercial considerations still count in this respect, whilst artistic ideals need not suffer.

Yours faithfully,

F. M. LAMBERT

PUBLICATIONS RECEIVED

Enginemen's Mutual Improvement Class Papers. London : *L.M.S. Magazine*, Euston station, N.W.1. 7¼ in. × 9½ in. 16 pp. Illustrated. Price 4d., post free.—Already two issues, amounting to 23,000 copies, of these collections of articles reprinted from the *L.M.S. Magazine*, have been sold out, and this is abundant proof of the usefulness of this very practical series, designed for the assistance of enginemen in their duties. The present issue includes descriptions with helpful diagrams of lubricator parts, blow-down valves, sanding gear, cylinder relief valves, water gauges, duplex sand and blower valves, combination steam valves, steam brake cylinders, brake rigging, and gland packings. The principal features of the L.M.S.R. turbine locomotive are illustrated across the two middle pages by a reproduction from a sectioned wash drawing on which all the important features are named, while a general description is also given. The concluding page gives a list of the L.M.S.R. motive power depots with their identification numbers and letters. Altogether the book forms a very welcome and useful addition to the series of reprints already mentioned of articles taken from the last few years' issues of the *L.M.S. Magazine*.

Steam Locomotive Design. By D. Patrick (The Association of Engineering and Shipbuilding Draughtsmen). London : The Draughtsman Publishing Co. Ltd., 96, St. George's Square, S.W.1. 8½ in. × 5½ in. 92 pp. Illustrated. Price 4s. 0d. net.—In this publication the design of component parts of steam locomotives is discussed, embracing all the more important details with the exception of the boiler and its attachments. The author, in his foreword, states that his work began where that of Mr. T. Grime, who dealt in a previous book of the same kind with the preliminary design of the locomotive as a whole, had finished, namely, at the stage at which the wheel arrangement, size of cylinders, etc., had been settled. The present author has confined his attention to modern locomotives of normal design, and has endeavoured to treat the subject in such a way as to make the book as directly useful as possible to the practical draughtsman.

The subject is throughout written from the standpoint of design ; it does not treat directly with the finished locomotive or contain any drawings or photographs of completed engines. The illustrations consist of drawings, of which a number are reproduced, mainly designed to illustrate the method of plotting and laying out various components from the points of view of theory and practice. We can commend this publication to draughtsmen, students of locomotive practice, and others, in the belief that it will provide matter of the kind required in an up-to-date form, and effectively take the place of various books of reference which have become in course of time somewhat out of date.

Mathieson's Handbook for Investors for 1937. London : Fredk. C. Mathieson & Sons, 16, Copthall Avenue, E.C.2. 6½ in. × 3½ in. 355 pages. Price 5s.—This handbook, now in its 38th year of issue, records the Stock Exchange prices and dividends for the past ten years of selected securities, particulars of which for 1936 are compiled up to the end of November. The selection of investments is well made and they are grouped under 28 main heads.

Reference to any security mentioned in the publication is facilitated by a comprehensive index. Under British Railways are given particulars of all the stocks of the four group companies and of the Great Northern Railway (Ireland). Indian railway stocks or annuities mentioned number fourteen, and particulars are given of the more active stocks of sixteen Dominion or Colonial railways, nineteen American, and forty foreign railways. Other useful features of the publication are the dates of Stock Exchange settling days and holidays, a perpetual yield table, information as to trustee investments, and as to income tax for investors, with mention of the new dividend taxes in Canada and Argentina and the rate now leviable in the United States.

Easter Holidays.—A programme of holidays at home and abroad, from Dean & Dawson Limited, 7, Blandford Square, London, N.W.1, includes particulars of escorted motor tours in Ger many, and a train cruise in Italy. The same firm sends complete schedules for 1937 of sea travel and holiday camps. An interesting leaflet describes special educational tours for schools on the Continent and in Great Britain. It is emphasised that the exchange rates are particularly favourable for foreign travel this year, and an interesting table sets out the fluctuation in price of a typical Continental holiday since 1931.

Great Western Docks, 1937.—Produced and published by H. N. Appleby by arrangement with the Great Western Railway Company. 11 in. × 8 in. × 1 in. 334 pp. Illustrated, with folding maps.—The diversity of traffics dealt with gives an exceptional interest to the docks owned by the Great Western Railway. In addition to the large group in South Wales, the principal export of which is coal, there are others such as Plymouth, Weymouth, Brentford and Fishguard, all of which serve different purposes. Plymouth, for instance, is described as " the gateway from the Atlantic Ocean." Fishguard is, of course, the G.W.R. port for Ireland, and Weymouth has an extensive traffic to the Channel Islands. Brentford, on the other hand, is used by small vessels carrying cargoes to and from the Continent and by barges. In addition to profusely illustrated descriptions of all these and other docks, great and small, owned or served by the company, this compendium of information contains intelligence concerning such matters as rates and charges, steamship services, warehouses, and other facilities provided for the convenience of the trader. A feature of special interest is a series of what are called " Trade articles " ; these occupy some thirty pages, and cover such subjects as the South Wales coal trade, the grain trade, and the general cargo trade of South Wales. The many maps and large folding plans are a valuable feature of the handbook.

Open-Air Holidays Abroad.—Thos. Cook & Son Limited sends a programme of walking, cycling, canoeing, and climbing holidays on the Continent. Parties will leave London on various dates from March 25 until mid-September, accompanied by an experienced guide. Twenty circuits have been arranged for walkers, with the mileages graded to appeal to varying degrees of energy. The Rhine Valley, the Black Forest, and the Harz Mountains are among the areas to be visited in Germany, while other walking tours embrace the Bernese Oberland, the Ardennes, the Tyrol, and Western Norway. Canoeing holidays have been arranged on the Moselle between Trier and Coblenz, and are combined with rambles through the beautiful riverside scenery. For cyclists, tours will be made in Germany, Austria, Bavaria, and Belgium, while climbers enjoy special facilities in the Swiss Alps.

Factory Sites.—An attractively-arranged pamphlet bearing this title on a Cellophane cover has reached us from the Southern Railway Docks and Marine Manager at Southampton. The purpose of this publication is to draw attention to the 130 acres of reclaimed land, lying behind the new docks, which have been reserved for the erection of factories and industrial premises. Special attention is drawn to the favourable position of Southampton in relation to the industrial centres of the South, the Midlands, and the Thames basin. Furthermore, stress is laid upon the excellent transport services of the port. Power, ample for the requisites of modern industry, is also available. The pamphlet, in addition to giving details of the other amenities of the town, sets out lists of local industries and overseas shipping services. It is interesting to note also that there are now more than 30,000 ft. of quays, and that these are equipped with 143 cranes, ranging up to 50 tons in capacity. There is also the floating crane capable of lifting 150-ton loads. The quays, transit sheds, and warehouses, which have a total floor area of nearly 2,000,000 sq. ft., are served, moreover, by 62 miles of railway lines. In " Factory Sites " air-brush impressions and photographs are displayed at arresting angles, as also is the briskly written text.

THE SCRAP HEAP

The morning tea on British sleepers lifts our sleeping car service above all others in the world. Who would dare to ask for morning tea on the Continent?—*H. V. Morton in "The Daily Herald."*

* * *

In consequence of the increase of railways and the decline of the road, the stage proprietors intend emigrating to "Coach-in-China."—*From "Punch" of April 22, 1843.*

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TRAIN OF CROCODILES FOR BIG BUOYS

Seventy-three big buoys, are being carried by Great Western Railway special trains from Chepstow to Newport. Each buoy is over 10 ft. in height, has a girth of 40 ft. and weighs 8 tons. As the buoys are an outsize in railway freights special arrangements have had to be made to keep the adjoining lines clear of traffic during their journey. The wagons on which these buoys travel are known in the railway world as "crocodiles."

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THE FLORIDA SPECIAL

The Florida Special, which began its fiftieth year of continuous operation between New York and Jacksonville on January 8, embodied many unique features when inaugurated in 1888. All six of its cars (three sleepers, diner, combination library and smoker, and baggage car) had enclosed vestibules in a day when open platforms were the rule; it was steam-heated throughout; was equipped with the then new Westinghouse air brakes; and was one of the world's only two trains to be electrically lighted throughout—the other was in service between London and Brighton, England. The train operated on a 30-hr. schedule three times a week, only three hours slower than its present running time.—*From "The Delaware & Hudson Railroad Bulletin."*

* * *

"WESTERN" BROTHERS

We are reminded by a paragraph in the *Western Morning News* that this year is the centenary of two important dates in connection with the noted West Country brothers Richard Hurrell Froude, the divine, and William Froude, engineer. Sons of Robert Hurrell Froude, Rector of Dartington, and later Archdeacon of Totnes, their brother, James Anthony Froude, was the historian. Richard was educated at Ottery free school (where he lived in the same house as the elder brother of Samuel Coleridge Taylor) and at Eton and Oxford. He became Fellow and tutor of Oriel College, Oxford, and it was there friendship with Cardinal Newman ripened. His health failed, and he died after having contributions published in *British Magazine* and writing three *Tracts for the Times*. A year later, in 1837, two volumes of *Remains* were published posthumously. His brother William joined the engineering staff of I. K. Brunel on the Bristol & Exeter Railway in 1837, and was in charge of line construction between Whiteball tunnel and Exeter.

* * *

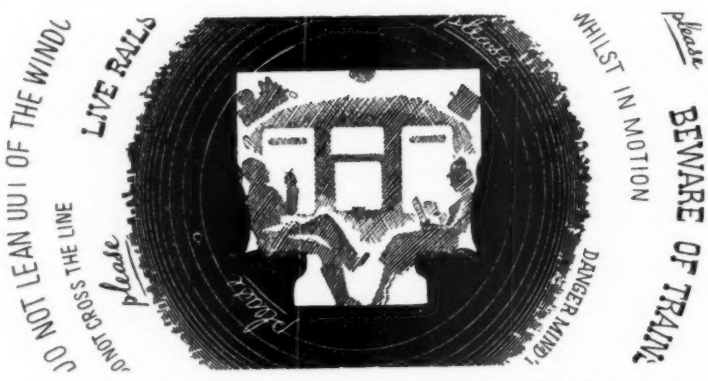
Encouraged by the success of the flower show held in Pennsylvania station, Philadelphia, last autumn, employees of the Pennsylvania Railroad have organised a garden club to promote, increase, and strengthen interest in the culture of flowers. It will be known as the Pennsylvania Railroad Garden Club, and, while the headquarters will be in Philadelphia, membership is open to any employee or member of his family on the entire Pennsylvania system. Plans are being made for visits by the club members to the numerous noted gardens in cities on the Pennsylvania Railroad.

* * *

From time to time we have published in this column various remarks about the trouble experienced by certain railway administrations, chiefly in India and the U.S.A., with non-fare-paying passengers. The following quotations from the 1878 columns of one of our constituents show that neither the nature nor the extent of this trouble is new:—

Tramps who claim to be in search of work in harvest fields are giving much trouble to the Western railroads in America, as well as local authorities. They congregate at certain places in large numbers, and endeavour to take possession of trains and secure passage by force of numbers. Incidents of this character are daily reported from different sections of Illinois, Iowa, and Wisconsin, some being doubtless exaggerated. An amusing incident arose out of a despatch recently received at Milwaukee stating that 250 tramps were on an incoming freight train. All the available police force was mustered, and reinforced by fifty hastily-armed yardmen; the force was drawn up at the head of the yard, and, after waiting an hour in the sun, the train came in, a box car was opened, and *five* dilapidated specimens crawled out. The operator had made a mistake in the number.—*From "The Railway News" of August 3, 1878.*

A novel excursion party has recently passed over an American railroad. It is reported that on the 31st ult. a train on the Mississippi Central Railroad was boarded by about 100 tramps. The tramps ordered the conductor to start his train, which he refused to do unless they got off. They thereupon severely beat the conductor and started the train themselves, and were running it to suit themselves at last accounts.—*From "The Railway News" of November 16, 1878.*



A sketch used to illustrate an article in "Over the Points," the entertaining quarterly review of matters concerning the Southern Railway, issued to season ticket holders. This, amongst the other decorations, is by Victor Reinganum, whose design of carriage seats fortunately does not do justice to the Southern Railway accommodation

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

VICTORIA

New Railways Finance Bill

Both Houses of Parliament have now passed the Bill transferring approximately £30,000,000 of railway loan indebtedness to the general account of the State. This important measure towards placing the railway finances on a proper footing contains a vital clause for the formation of a Renewals and Replacements Fund, into which a minimum sum of £200,000 is to be paid annually and such additional amount as may be appropriated by Parliament. Some £600,000 a year are required to provide fully for depreciation. It is estimated that the £1,300,000 relief in interest charges will be absorbed mainly in meeting the railway deficit, estimated at £478,000 in the current year, and the loss of Treasury recoups on non-paying lines, totalling about £580,000, as well as in freight reductions on certain classes of agricultural traffics such as wool and livestock. The Railways Department will also contribute £120,000 per annum to the National Debt Sinking Fund in respect of railway loan liability. A portrait and brief biography of Mr. T. F. Brennan, until December, Comptroller of Railway Accounts, who was largely responsible for the preliminary work leading up to this Bill, appear on page 327.

INDIA

Road Competition Countered

The year 1935-36 witnessed the extension of road competition to goods traffic in the area served by the Bengal Dooars Railway. In spite of strong representations made to the Government, no progress has been made towards the enforcement of regulations in the running of buses in the Dooars, except that the local authorities prohibited the plying of buses and taxis for hire on the route between Chalsa and Bagrakote on account of the existence of alternative facilities for the transport of passengers. The B.D.R. authorities were alarmed when a number of tea estates took advantage of a lorry service between the gardens and Maynaguri Road station for the despatch of tea and the receipt of coal and other inward traffic. The prospect of a further increase in this method of transport was also more than a possibility, in view of the metalling and bridging of roads now in progress. The railway, therefore, opened negotiations with the tea estates, and an agreement has been reached whereby the railway, in return for a reduction of freight, will be able to retain the traffic of most of the gardens. The Bengal Dooars Railway was constructed primarily to serve the tea industry in the Dooars, and the progressive policy of the railway has in a large measure contributed to the growth and prosperity of the industry in that district. The acceptance by the tea estates of this fact, and the appreciation by the railway of the desire of the tea companies to effect economy in transport charges, have enabled the conclusion of a give-and-take agreement which is worthy of emulation.

CANADA

New T. & N.O.R. Passenger Stock

Ten new coaching vehicles recently ordered from the National Steel Car Corporation by the Temiskaming & Northern Ontario Railway represent the latest practice in all-steel, elliptical roofed, passenger stock in North America. Six of these are first class cars each seating 58 passengers and the other four are brake-passenger composites, each seating 38 passengers in roughly half the length of the vehicle, the other half being available for baggage. The dimensions of both types are identical, except that, as the baggage compartment has no vestibule, the length over body end posts of the composite is 2 ft. 6½ in. greater than in that of the passenger car. The dimensions of the latter are:—

Length over diaphragm plates	79 ft. 10½ in.
,, ,, vestibule I beams	77 ft. 11in.
,, ,, body end posts ...	71 ft. 0 in.
Distance apart of bogie centres	55 ft. 2 in.
Width over girder plates ...	9 ft. 10 1/16 in.
Height, rail to platform ...	4 ft. 3 in.
,, ,, top of roof ...	13 ft. 1⅛ in.

The underframes are of the fish-belly type, but the various members of the steel bodies are riveted, and not welded, as are the roofs to the bodies and bodies to the underframe. Special attention has been paid to floor insulation where Salamander and Hairinsul are freely used. In the interior decoration Sundeala and Masonite predominate in contrasting fawn shades with a blue Marboleum floor covering with lighter blue stripes in the aisles. [These vehicles are fully described and illustrated in our contemporary *Canadian Transportation*.—ED. *R.G.*]

UNITED STATES

New Union Station at Los Angeles

The Atchison, Topeka & Santa Fe, Southern Pacific, and Union Pacific Railways are jointly constructing a new union station at Los Angeles to replace the two stations at present used by these lines. It is a terminus, but the station buildings are alongside and parallel to the tracks and platforms, but at a lower level so that access to the latter can be obtained by a subway and ramps. Baggage, mails, and parcels are dealt with in a long "utility building" built in two storeys between the platforms and the station building. The lower storey is more than double the width of the upper, the roof of the wider part of the former serving as an approach road to the latter at track level.

Unlike most American stations architecturally, this one is of moderate though varying height, and is, in fact, a rambling structure covering a large area, and laid out so as to resemble somewhat a church or abbey with cloisters and transepts, or patios and arcades. Entering from Alameda Street by a main vestibule, the restaurant is to the right, main concourse, booking hall, and station offices to the left, and waiting room leading to the train concourse and subway to the platforms in rear. There are eight platforms each 31 ft. wide and long enough to accommodate 20-car trains. Platform roofing supports will be spaced 80 ft. apart. All structures are being built to resist earthquake shocks, each being subdivided into independent self-supporting units of limited horizontal dimensions, according to our American contemporary the *Railway Age*.

Floods and Labour Troubles

There has been a perceptible slowing down in traffic prospects of the American railways during the past fortnight, arising from labour difficulties in the road motor manufacturing industry (normally a large consumer of raw materials which move by rail), and from the disastrous floods in the Ohio Valley. While as yet there have been reported no instances of major damage to railway property from these floods, there are many bridges still in danger at the time of writing, and there have been several derailments caused by washouts. But, more harmful than the physical damage has been the restriction of traffic at several important centres, among them Cincinnati and Louisville, two-thirds of which latter city is at present inundated. Virtually no traffic save relief supplies is moving through these important areas.

Train Staff Wage Rise Demand

The employees of the five "brotherhoods" representative of train- and enginemen and shunters, who [as recorded on page 214 in our issue of January 29—ED. *R.G.*] are demanding a 20 per cent. wage increase and a 30-hr. week, are the "aristocrats of railway labour," earning from £40 to £70 monthly, and any concession to them would be followed by a demand for a similar increase to other grades. Meantime, the unions have also introduced their Bills in Congress for the 6-hr. day and other costly "make work" legislation, despite the fact that, even with the substantial improvement in railway traffics, the railways earned only 2½ per cent. on invested capital in 1936. It is certain that not all of their demands could be

granted without bankrupting the industry; and few are disposed to believe that the labour leaders would wish to go so far as that. At any rate, the demands have given rise to no great pessimism in the share market.

Slim Pickings for Ski Trains

The railways serving New York, Boston, Philadelphia, Chicago and other large centres had hoped to do a lucrative business in the running of ski excursions this winter, but there has been little or no snow. Sales of winter sports apparel at the shops showed that the public was prepared to patronise these trains in unprecedented numbers, but the winter throughout the East has been warm, with incessant rains. In the West, the Union Pacific has been somewhat more fortunate. It opened in January at Sun Valley, Idaho, a winter sports hotel, with luxurious accommodations for 250 guests, catering for devotees of all varieties of winter sport. Favoured with snow, the rendezvous has become an immediate success and is fully booked up for weeks in advance. This is no trippers' resort, and the railway enjoys a long haul from all patrons, whether they come from the East or from Southern California.

BRAZIL

First Railway Signalling Conference

The first railway signalling conference in Brazil, held in conjunction with a signalling exhibition, concluded on December 9, having approved resolutions for the establishment of a standardised code of signalling. It is recommended that a preliminary code be drafted by the Federal Inspectorate of Railways, which will collect by itself, or through the Brazilian Association of Railway Engineering, all the information it requires from the various railways in Brazil. This draft, covering audible, semaphore, luminous, and disc (shunting) signals, is to be submitted to the Government for approval. Red, yellow, and green will be adopted as the standard signalling colours. The importance to the Brazilian signalling industry of such standardisation of principles is also insisted upon, and the Federal Government is urged to create as soon as possible a committee of experts to advise upon the adoption of new apparatus produced by manufacturers in Brazil.

The Selection of Systems and of Staff

The resolutions also lay down rules for the selection of mechanical or power signalling according to the volume of traffic. At small stations, where there is low-speed shunting and the signalman has an unobstructed outlook, mechanical frames are recommended. Electro-mechanical signalling is advised for stations with little shunting but more frequent train movements; and all-electric signalling for stations with heavy shunting and intensive train service. Psycho-technical tests are recommended to govern the appointment and promotion of drivers, signalmen, and signal fitters, and attention is called to the desirability of compulsory periodical medical examinations for all members of the operating staff.

EGYPT

Abu-Za'bal Workshops

The controversy regarding the policy to be pursued with regard to the Abu-Za'bal shops is still undecided. The position at present is that over £.E.300,000 has been spent on buildings and equipment, and all light and heavy locomotive repairs are now concentrated there. Employees to the number of over 1,000 have almost all to be taken out from and brought back to Cairo by special train daily, and the cost of completing the transfer of all work and staff, including housing, is estimated at £.E.2,000,000, whereas the cost of reverting to Anaber shops would be about £.E.500,000. There would presumably be a considerable credit in respect of the site value of the latter.

CHINA

Chung Cheng Bridge

The Chung Cheng bridge at Nanchang, the capital of Kiangsi Province, was completed at the end of 1936, having taken two years to construct. It crosses the Kan River and completes a through connection between Nanchang—Kiukiang, and Chekiang—Kiangsi Railways. The bridge is 3,535 ft. long and has 18 spans. The cost was $967,000.

The Canton-Kowloon Train Fire

With reference to the serious fire on a train running on the Chinese section of the Canton-Kowloon Railway on January 16, in which several passenger coaches were burnt out and heavy casualties resulted, reports up to January 20 give the number of deaths as 112, as well as a large number of persons sustaining severe injuries. Earlier reports gave the number of passengers who perished in the flames as 72, and an unspecified number of passengers and members of the crew among the injured. An inquiry is at present being held by the railway authorities. The origin of the fire is said to be due to a passenger having accidentally set alight a celluloid toy, and this in turn set other articles ablaze. The flames spread rapidly, owing to the rush of air as the train proceeded; large numbers of imported celluloid toys have been on sale for Christmas. There was no means of communication on the train, and three coaches were alight before the driver became aware of anything wrong. The three coaches were completely burnt out. When the passengers saw the fire spreading in the coach they tried to escape into other coaches, and many were trampled under foot and injured. The absence of communication cords is accounted for by their misuse by passengers who do not understand their purpose. Apparently there was not through braking on the train; otherwise the guard could have controlled it. The train was brought to a stand near Sheklung, about 50 miles from Canton, and the injured passengers were taken to Canton for attention.

Yangtze Bridge Site Near Hankow

Surveying has begun for the new bridge over the Yangtsze River to give through connection between the Peiping—Hankow and Canton—Hankow Railways. The work is in the hands of the Ministry of Railways, and according to the latest plans the bridge is to extend from Wuchang to Hanyang and then across the Han River to Hankow. Several alternative sites are available for this great structure, and very careful survey and estimating will be necessary before the best one can be finally selected.

Canton-Kowloon Railway International Finance Committee

A Canton—Kowloon Railway loans sinking fund administrative committee has been formed by the Ministry of Railways to readjust the outstanding obligations of the line. The Ministry of Railways will be represented by Messrs. Li Lu-chao, and Ling Hung-hsun, and there will also be a representative each from the British and Chinese Corporation, and Jardine, Matheson & Co.; the committee will be under the chairmanship of Mr. Li.

New Engines from Europe

Ten new locomotives for the Lung-Hai, and four for the Tientsin—Pukow Railways, arrived at Tsingtao in parts on January 9 from Europe. The engines will be assembled in the locomotive shops of the Kiaochow—Tsinan Railway, and will then proceed on their own wheels to their respective destinations.

New Construction Works

A further section of the westward extension of the Lung-Hai Railway was completed on December 7, the new railhead being at Paoki, about 170 km. west of Sian. Here the two further extensions (*a*) south-westwards to Chengtu, the capital of Szechwan, and (*b*) westwards to Lanchow will fork.

The great 2-km. bridge over the Yellow River near Fenglingtu to connect the Tatung-Puchow and Lung-Hai Railways has been begun. It will directly link Puchow with Tungkwan, on the latter line.

Orders have been issued for the Tatung-Puchow construction work to be extended northwards from Yuanping to Yangfangkow, so as to improve communications between Shansi and Suiyuan.

Construction work on the first two sections of the Hunan-Kweichow Railway is now under way, and surveys of

the third and fourth sections will soon be completed.

ITALY

Rome Station Reorganisation

Of the several interesting developments at present in train with a view to increasing the capacity of some of the principal stations in Italy, that at the central (Termini) station in Rome is typical. Arrangements are being made whereby only the fast main line services will use this station, while the stopping train services are to be divided among the various secondary stations. At the Termini station the scheme involves the demolition of all the buildings now housing the district administrative and booking offices, restaurant, &c., and the reconstruction of the front of the building some 200 metres back from the present facade, practically in line with the Via Cavour. On this new alignment will be erected the whole frontage of the station from the Via le Principe di Piemonte to Via Marsala, so that a large additional area will be available as an entrance hall for passengers. A long covered area will be provided for road vehicles, and the wide over-all roof spanning the arrival side is to be replaced by umbrella roofing. The 24 lines in this station are to be rearranged and re-interlocked so that each may be used for either arrival or departure traffic. New waiting rooms, booking hall, restaurant, and other offices are to be built.

Redistribution of Traffic

The accelerated stopping and the light trains from Genoa and Pisa will be concentrated at the Tiburtina and Trastevere stations, and the Ostiense station will handle the freight traffic. A new station to accommodate the accelerated stopping and light train traffic, as well as the freight traffic from Florence is to be built on the Salaria road on a level with the Littorio airport. The Prenestina station, between which and Rome-Termini additional lines will be laid, is to be used as a carriage depot for making up trains, and new steam and electric locomotive sheds are to be erected by rebuilding the terminus at San Lorenzo. The Tuscolana station also is to be rebuilt and enlarged.

New Underground as Outlet to Ostia

The Government attaches considerable importance to the development of Ostia, the port of Rome and the seaside week-end resort of the Romans. The Rome—Ostia line of the Societa Elettroferroviaria Italiana, runs from the Lido station (Rome—S. Paolo at the Porta Pia) to New Ostia near the casino on the sea-front. It is at present double line with a capacity of about 10,000 to 15,000 passengers an hour in both directions, but two additional lines are to be laid in preparation for the Universal Exhibition of 1941 and are to be extended as a double underground line beneath the Via del Mare, Piazza Venezia and Piazza Cinquecento Rome-Termini; this will be the first step towards a metro line for Rome.

In accordance with successful trials in recent years, the Rome—Ostia trains, which each consist of an electric locomotive and six bogie trailer coaches, are now fitted with a motorman's compartment in the last trailer, so that they can be driven in either direction, as with a multiple unit train, the engine run-round thus being saved; speeds up to 56 m.p.h. (instead of the present 40 m.p.h. limit) can safely be run in either direction. With increased power and speed of the locomotives, therefore, the capacity of this line can be considerably increased.

Genoa Stations

Another interesting feature of the scheme generally is the decision of the Italian Government to provide Genoa with a new central station as the Principe station no longer meets the requirements of traffic, and for this purpose the Brignole station is to be rebuilt and enlarged so as to make a fine new central station there.

SPAIN

The Northern Railway

The Northern of Spain Railway has now established its provisional headquarters at Valladolid, and the company's administration at this point is now working the whole of the system throughout that part of the country which is under the control of the Nationalist (Franco) forces. The principal locomotive repair shops and stores depot of the Northern Railway were originally and have always been at Valladolid, which is therefore a very convenient central point in present circumstances for the provisional seat of the administration. It will be remembered that the administration of the Northern Railway, together with that of the other principal Spanish railways, was seized, on the outbreak of the civil war, by a " workers' committee " of the syndicates making up the Popular Front, and this action was subsequently legalised by a Decree of the Government. Most of the Northern system, however, is in that part of the country controlled by General Franco's forces, where railway working is normal, or as far as it can be normal under war conditions. Apart from the seizure of the company's property, the station and offices at Madrid are reported to have suffered serious damage, situated as they are near the Western Park and University City, the scenes of the bitterest fighting of the war.

The Esla Viaduct

In the north-western corner of Spain a railway is being constructed to connect Zamora with Monforte and Corunna, on which there are some important engineering works, chief among them a great viaduct spanning the Esla Valley. It is a reinforced concrete structure containing the largest r.c. arched span in the world, 672 ft., with a rise of 127 ft. The viaduct will carry a double line of 5 ft. 6 in. gauge railway at a height of 295 ft. above the level of the river bed, and is 1,640 ft. in length, of which 960 ft. nearly centrally, are straight, and the remainder on 1,312-ft. curves and transitions. There are eight smaller r.c. arches of 72-ft. span, five on one side of the great main span, and three on the other; also a 29 ft. 6 in. steel girder approach span at each end.

The piers carrying the small arches are hollow r.c. work, varying in height from 33 ft. to 127 ft. and 26 ft. 3 in. wide, but varying from 11 ft. 6 in. to 14 ft. 8 in. in thickness at the top. These arches are 24 ft. 6 in. wide, and 4 ft. thick at the crown, tapering to 6 ft. at the springings. The decking is carried on spandrel columns rising from the arches and piers. There are expansion joints in the decking over the crown of the arches.

The Main 672-ft. Reinforced Concrete Span

The main arch is a hollow three-cell rectangle in cross section, 26 ft. wide × 14 ft. 10 in. deep at the crown and 29 ft. 9½ in. thick × 18 ft. deep at the springings. The flanges vary in thickness from 2 ft. 4 in. at the crown to 3 ft. 5 in. at the springings, and the four connecting webs are 16 in. thick. There are five spandrel piers on each side carrying six 41-ft. continuous decking spans, an expansion joint separating this 270 ft. of decking from the central sections. Reinforcement consists of rolled steel sections and round bars. The abutments also carry the high piers springing from the extrados of the arch supporting the end spans of the approach decking and those over the main arch. [This viaduct is fully described in the December issue of *Concrete* from which these notes are taken.—ED. *R.G.*]

JAPAN

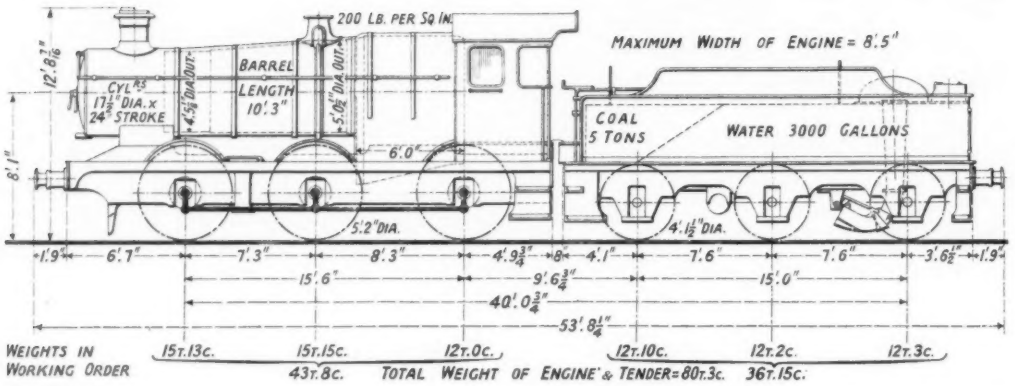
The Usami tunnel on the Ito Railway, situated on the Izu peninsula, has just been completed. The tunnel is 2·9 km. long, is situated between Ajiro and Ito, has cost Y.2,220,000, and has taken four years to construct owing to the very high temperature in the workings.

HOLLAND

Increased Traffics at Last

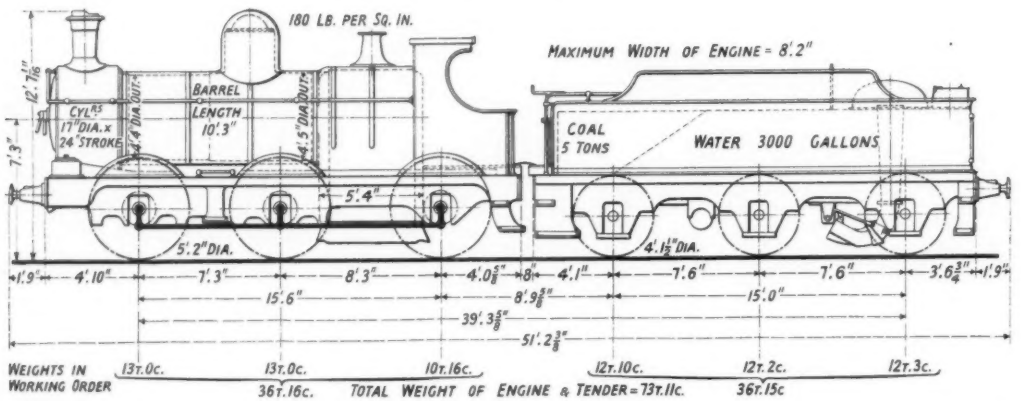
For the first time for many years the returns for November last show a higher number of wagons loaded than in the corresponding month of the preceding year. The improvement was also maintained in December, and was more pronounced, 30,189 wagonloads of merchandise and commodities other than coal being carried, as compared with 25,196 in December, 1935.

British Locomotive Types—III



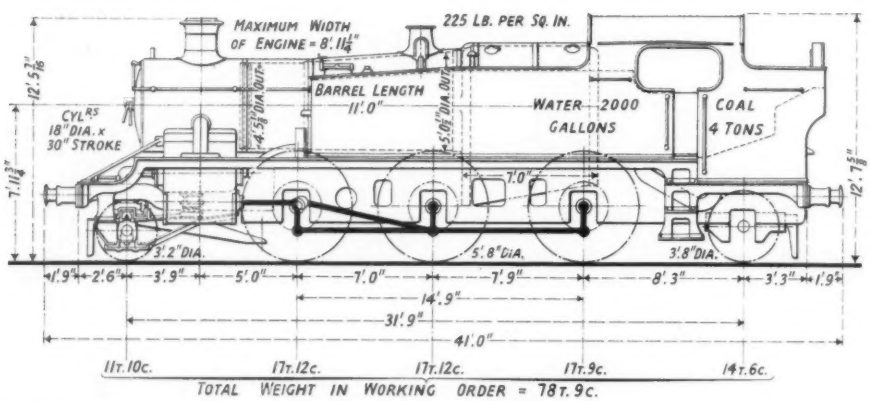
HEATING SURFACE, TUBES—		SUPERHEATER	75·68 SQ. FT.
LARGE AND SMALL	1,069·42 SQ. FT.	COMBINED HEATING SURFACES	1,247·5 ,,
FIREBOX	102·40 ,,	GRATE AREA	17·40 ,,
TOTAL (EVAPORATIVE)	1,171·82 ,,	TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	20 155 LB.

"2251" *Class*



HEATING SURFACE, TUBES—		SUPERHEATER	75·30 SQ FT
LARGE AND SMALL	960·85 SQ. FT.	COMBINED HEATING SURFACES	1,142·60 ,,
FIREBOX	106·45 ,,	GRATE AREA	15·45 ,,
TOTAL (EVAPORATIVE)	1,067·30 ,,	TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	17·120 LB. (18,140 LB. WITH 17½-IN. CYCLES

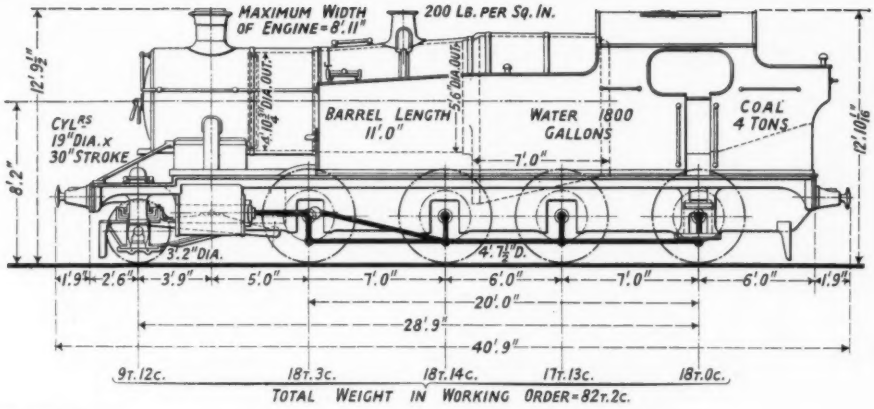
"2301" *Class*



HEATING SURFACE, TUBES—		SUPERHEATER	82·20 SQ. FT.
LARGE AND SMALL	1,144·95 SQ. FT.	COMBINED HEATING SURFACES	1,348·95 ,,
FIREBOX	121·80 ,,	GRATE AREA	20·35 ,,
TOTAL (EVAPORATIVE)	1,266·75 ,,	TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	27,340 LB.

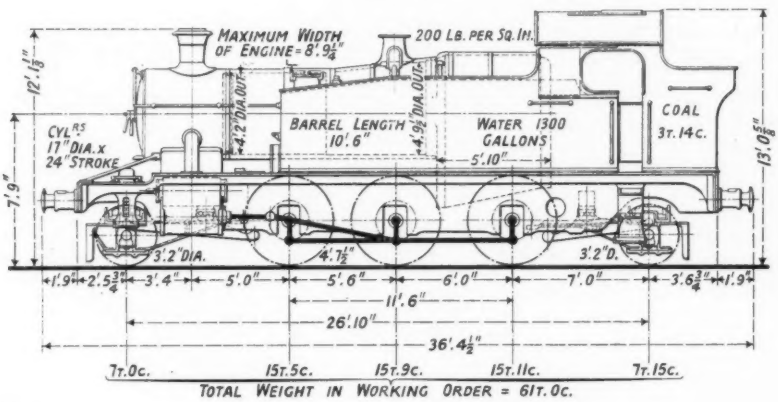
"6100" *Class*

Great Western Railway



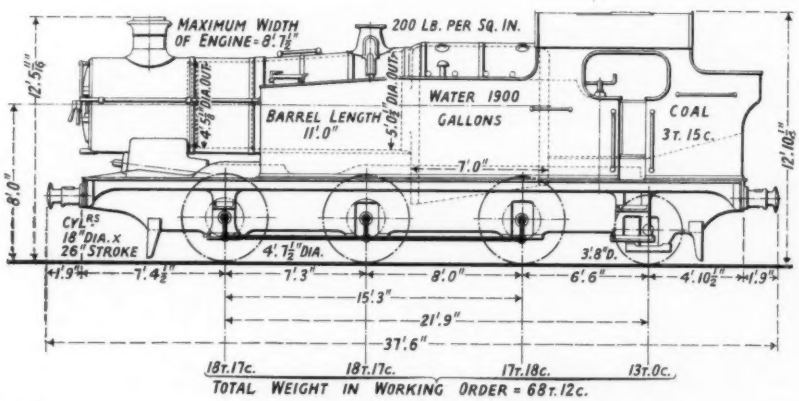
HEATING SURFACE, TUBES—		SUPERHEATER	191·79 SQ FT.
LARGE AND SMALL	1,349·64 SQ. FT.	COMBINED HEATING SURFACES	1,670·15 ,,
FIREBOX	128·72 ,,	GRATE AREA	20·56 ,,
TOTAL (EVAPORATIVE)	1,478·36 ,,	TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	33,170 LB.

"5205" *Class*



HEATING SURFACE, TUBES—		SUPERHEATER	77·64 SQ FT.
LARGE AND SMALL	992·51 SQ. FT.	COMBINED HEATING SURFACES	1,164·40 ,,
FIREBOX	94·25 ,,	GRATE AREA	16·6 ,,
TOTAL (EVAPORATIVE)	1,086·76 ,,	TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	21,250 LB.

"4575" *Class*



HEATING SURFACE, TUBES—		SUPERHEATER	82·20 SQ FT.
LARGE AND SMALL	1,144·95 SQ. FT.	COMBINED HEATING SURFACES	1,348·95 ,,
FIREBOX	121·80 ,,	GRATE AREA	20·35 ,,
TOTAL (EVAPORATIVE)	1,266·75 ,,	TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	25,800 LB.

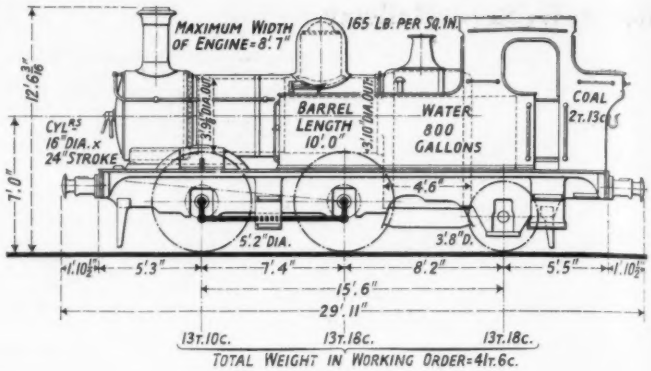
"5600" *Class*

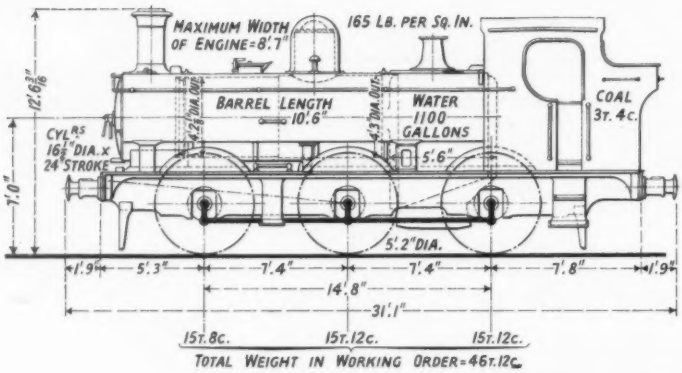
Great Western Locomotive Types—*Continued*

HEATING SURFACE, TUBES—	
LARGE AND SMALL	869·8 SQ. FT.
FIREBOX	83·2 ,,
TOTAL (EVAPORATIVE)	953·0 ,,
GRATE AREA	12·8 ,,
TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	13,900 LB.

"4800" *Class (Auto Engines)*
"5800" *Class (Non-Auto Engines)*

(Right)





HEATING SURFACE, TUBES—	
LARGE AND SMALL	1,004·2 SQ. FT.
FIREBOX	81·8 ,,
TOTAL (EVAPORATIVE)	1,086·0 ,,
GRATE AREA	16·76 ,,
TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	14,780 LB.

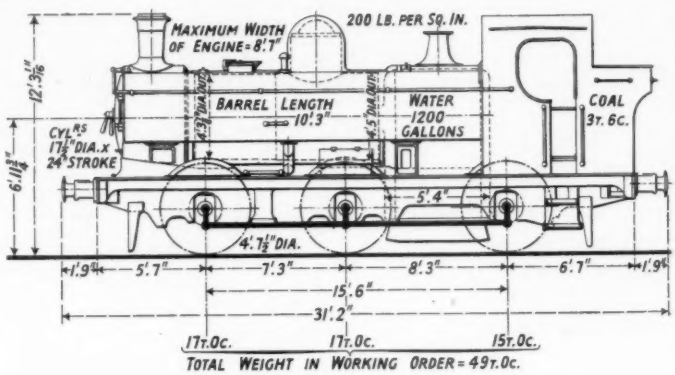
"5400" *Class*

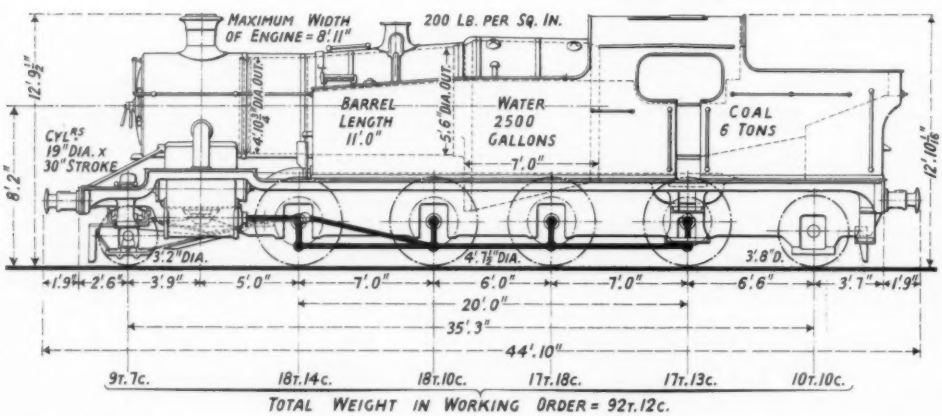
(Left)

HEATING SURFACE, TUBES—	
LARGE AND SMALL	1,012·8 SQ. FT.
FIREBOX	102·5 ,,
TOTAL (EVAPORATIVE)	1,115·3 ,,
GRATE AREA	15·3 ,,
TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	22,515 LB.

"5700" *Class*

(Right)





HEATING SURFACE, TUBES—	
LARGE AND SMALL	1,349·64 SQ. FT.
FIREBOX	128·72 ,,
TOTAL (EVAPORATIVE)	1,478·36 ,,
SUPERHEATER	191·79 SQ FT.
COMBINED HEATING SURFACES...	1,670·15 ,,
GRATE AREA	20·56 ,,
TRACTIVE EFFORT (AT 85 PER CENT. B.P.) ...	33,170 LB.

"7200" *Class*

NEW SIGNALLING AT LUTTERBACH, ALSACE-LORRAINE RAILWAYS*

Concentration of working with the aid of route levers

IN common with most others, the administration of the Alsace-Lorraine Railways has in recent years been seeking to reduce operating expenses by the use of improved signalling arrangements. After the war of 1870, when the lines belonging to the Chemins de fer de l'Est in the territory ceded by France under the Treaty of Frankfort passed into the possession of the German Empire, a separate management was set up for them and German operating and signalling methods, including right-hand running, were adopted. The signalling was thereafter almost entirely supplied by the Bruchsal (Baden) signal works, founded in 1868 and known for some years as Schnabel and Henning. Rod working was used for the points, as in Baden, contrary to the general German practice, and the signals were worked by single wire until about 1880, when double wires were introduced. Trailable points with point indicators, lock-and-block, and the control of all working at a station from a central point, were also adopted. In the course of time a few of the larger stations were fitted with power signalling; at others an electro-mechanical, or mixed, system was put in.

With the transfer of Alsace-Lorraine to France in 1918 a separate administration for the railways in those provinces was retained, and the operating methods have been but little changed. The cost of changing some, especially a reversion to left-hand running, would have been prohibitive, and except on a few short sections near the old 1871 frontier, right-hand working remains in force, while the German signalling arrangements have been only slightly altered. As these were based on a strongly centralised system of control over both shunting and running movements in station limits, it was natural that means should be sought to retain this while reducing the number of signal boxes, often considerable under the old system.

Fig. 1—Original station supervisor's apparatus, controlling three signal boxes by means of double-wire transmissions. (Note the L.M.S.R. advertisement behind the frame)

The Lutterbach Installation

A start has been made with an interesting installation at Lutterbach, a junction on the main Strasbourg—Basle line, where the single line from Kruth and Graffenwald comes in and a double line to Mulhouse Nord leaves that passing through Mulhouse—Dornach. Under the old arrangement there were 3 signal boxes, open the whole twenty-four hours, which were controlled mechanically by the station supervisor from an old fashioned crank-handle type control frame (Fig. 1), through double-wire transmissions. The apparatus in the cabins was also very old, having been in use for over fifty years, the point levers being of the type introduced by Schnabel and Henning in the 'seventies and, as seen in Fig. 2, resembling the English type. This form of lever was abandoned by the Bruchsal works about 1880. The mechanical locking was arranged vertically behind the frame, and was of strong construction, being actuated by route-handles, as is usual in Germany. The only way to concentrate all the working in the hands of the supervisor was to adopt power operation, and this has accordingly been done.

The layout of the station is shown on the diagram, Fig. 5, with the positions of the signals. These are of the colour-light type and arranged to give the indications detailed on the diagram, which are practically the same as those now in force in Germany and Switzerland. The starting signals have their own separate distant signals, placed on the home signal posts. In one or two cases the stop signals can show only a restricted proceed indication (2 green lights). The points are operated by electric motor machines, except two connections to sidings which are hand worked and key-locked from the supervisor's frame. Track circuiting is installed throughout station limits and is used not only to lock and control the running signals, but for point locking and the release of route locking and the lock-and-block apparatus. The condition of the various sections is shown on an illuminated diagram, where the signals are also repeated.

* Based, by permission, on an article by W. Lienhard, Signal Engineer, Strasbourg, in *Zeitschrift für das gesamte Eisenbahn-Sicherungs- und Fernmeldewesen*

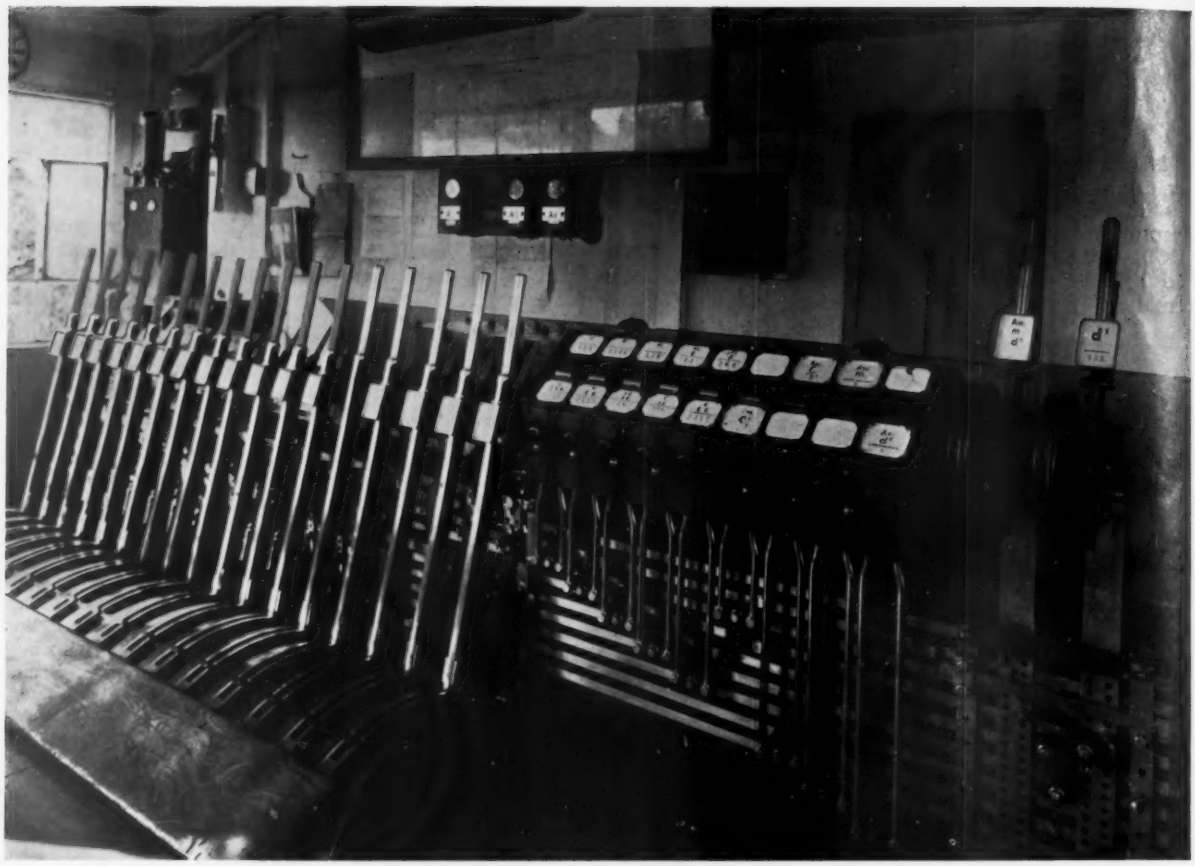


Fig. 2—Interior of one of the original signal boxes, showing mechanical frame over fifty years old. (Double-wire signal levers on right and route-handles actuating the locking)

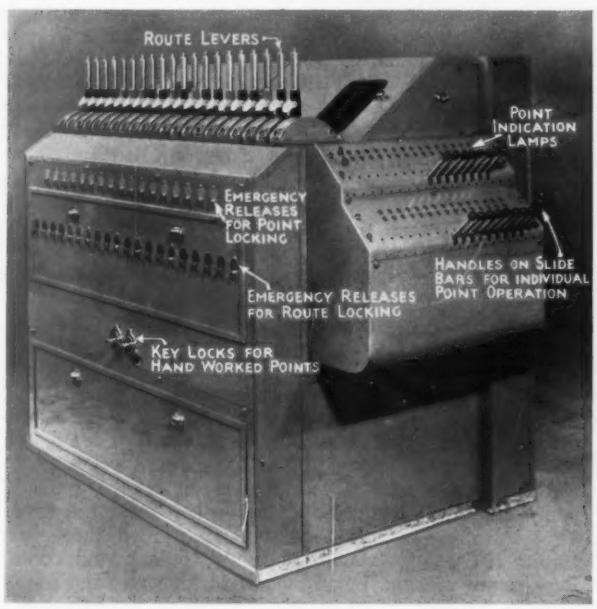


Fig. 3—Route lever frame, showing handles for operating points individually for shunting

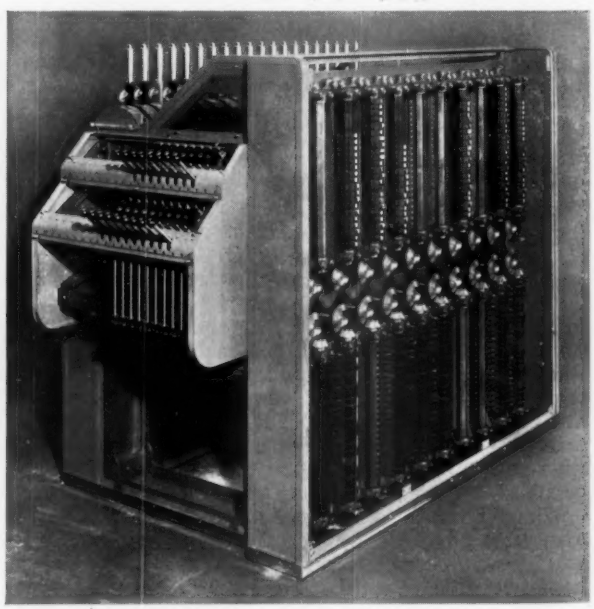


Fig. 4—Route lever frame, cover removed, showing contact spindles driven by the route levers

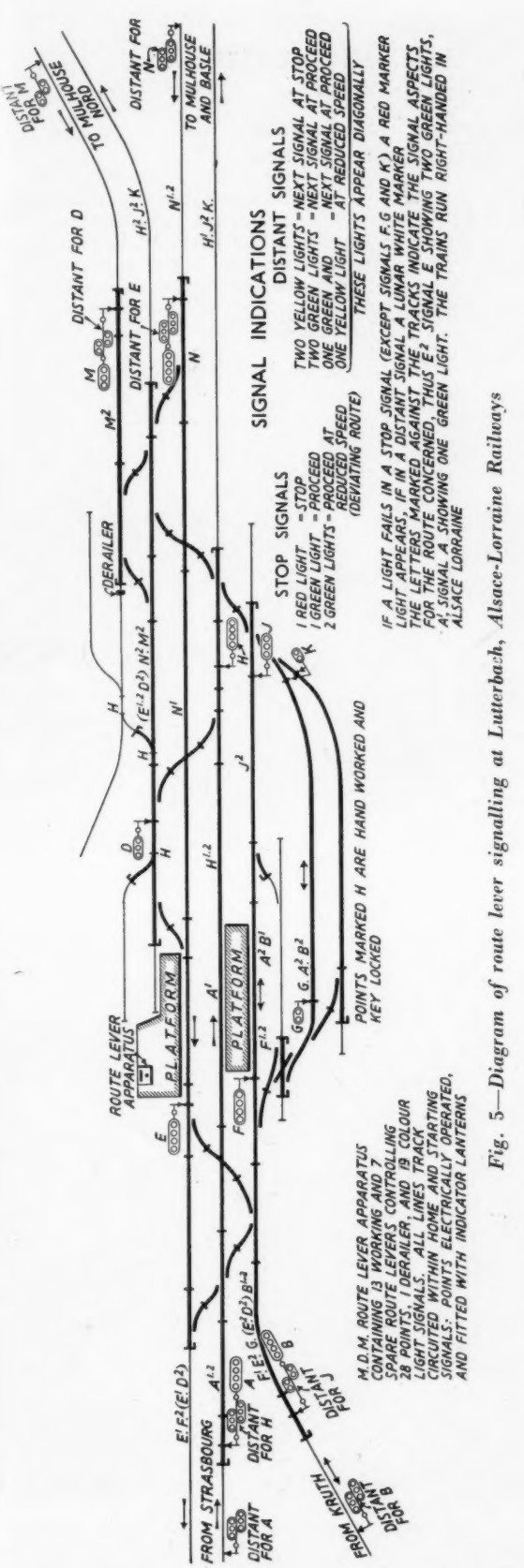


Fig. 5—Diagram of route lever signalling at Lutterbach, Alsace-Lorraine Railways

The other French railways have made extensive use of route-lever power working, several large installations being found on the adjoining lines of the Est system, but every movement, of whatever kind, being signalled, that method of working was easily adopted. In the present case it was a question of dealing with non-signalled shunt movements, but the MDM route-lever apparatus, Figs. 3 and 4, has been modified to permit of this. For running movements the working is the same as usual, the points being controlled by contacts driven by slide bars in the frame, which take the place of the point levers of the individual lever system. These are moved to and fro, in the requisite combinations, by cams on spindles driven by the route levers, resulting in the simultaneous setting of all points in a route when one of those levers is moved. The latter stand normally in a central position and control two routes by a push-and-pull motion, the electric point and route locking acting on the slide bars. To enable points to be moved individually for shunting without signals, the slide bars are provided with handles projecting at the end of the frame (Fig. 3), enabling them to be pushed or pulled, provided, of course, they are not locked by a route lever concerning them, or the track locking. Repeating lamps are provided over these handles. The illuminated diagram is normally dark, except for the signal repeating lamps. An occupied section is shown by red lights, but when a route lever is operated the whole route concerned lights up white, indicating the train path set up, until the train passes, when its position is shown by the red lights. These arrangements have enabled the whole of the working to be dealt with efficiently and economically by the station supervisor. The lock-and-block working has been combined with the frame in an interesting manner. Short track circuits in rear and advance of the home signals (Fig. 5) prepare the release of the block as a train passes, completing it as soon as it has cleared them and the signal has been returned to danger.

Signals and Power Equipment

The colour-light signals, which are permanently illuminated, have 220 mm. (8·6 in.) lenses for single, and 160 mm. (6·3 in.) lenses for double light indications, with 15-watt double filament lamps, fed from trickle charged cadmium-nickel accumulators placed at the signals. A red marker light appears if a stop signal fails; and a lunar white one if a distant signal becomes defective. The point indicator lamps are fed direct from the a.c. supply. Track circuit relays and batteries are housed in the station, except for the outermost circuits. The longest track circuit is about 500 m. (547 yd.), and 4-ohm relays are used. Power is obtained from an a.c. supply, transformed and rectified into 140 volts d.c., from which the main accumulator battery is charged. This has a capacity of 420 ampere-hours and supplies the point machines and electric locking circuits. To meet the possibility of the supply being interrupted for more than 12 hours, a petrol-driven generator set is provided, while a motor-generator set is able to supply a.c. for a short period.

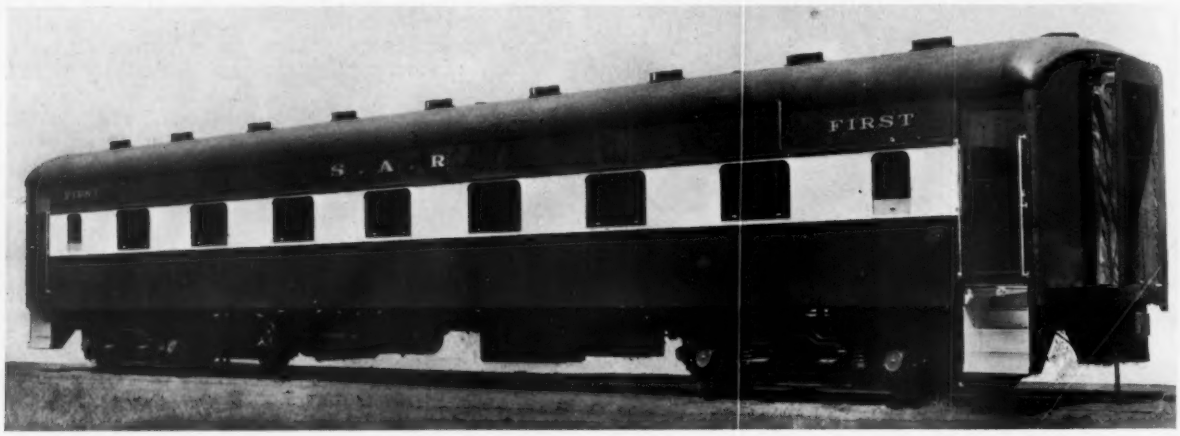
Results Obtained

The station can now be worked from one point and with nine fewer signalmen per twenty-four hours, while the movements are more quickly and safely performed. In consequence the Alsace-Lorraine Railways intend to equip five further stations, where the present mechanical signalling is out of date and the operating conditions are similar to those at Lutterbach, for which the apparatus was provided by the Aster Company in Paris.

ALL-WELDED PASSENGER STOCK IN AUSTRALIA

New steel passenger coaches for the South Australian Government Railways are the first all-welded vehicles to be designed and built in the continent

THE first of a series of welded steel corridor passenger cars designed and built at Islington workshops, South Australian Government Railways, successfully underwent a trial run recently. It forms a very attractive addition to the passenger rolling stock, having an external finish of green and cream, relieved with red and black lines. The car illustrated is one of two first class vehicles; with four second class cars of somewhat similar design, a complete train is formed, catering for travellers over the broad gauge system between Adelaide and Terowie, making connection with the East-West and Broken Hill expresses. On completion of the Red Hill line similar cars will also be used on the Adelaide-Port Pirie run. In all, twelve cars are to be built.



One of the first-class cars, showing the smart exterior appearance resulting from the two-colour livery—green and cream

The cars are of the side corridor type, 71 ft. long, and 9 ft. 6 in. wide over body, mounted upon two four wheel bogies, at 56-ft. centres; the bogie wheel base is 9 ft. The overall height of the car is 13 ft. 6 in. from rail level. Sides are straight, the ends flared, and roof elliptic. The superstructure and exterior panelling are of steel, built integrally with the underframe, and forming a comprehensive unit to carry the load and withstand the buffing shocks of modern heavy trains.

The whole structure was designed for welding, resulting in a steel car of adequate strength, combined with light weight. That this has been attained is borne out by the fact that the tare weight is under that of the older types of timber corridor cars of similar dimensions and passenger carrying capacity. This is the first all-welded railway passenger car designed and built in Australia.

To prevent noise of drumming and to resist heat, hair felt insulation in sheet form is applied to the inner side of the side panels, and held in position with non-setting bituminous paint and spikes welded to the panels. The roof ribs are of the open type, consisting of two small angle steel sections having distance pieces welded thereto; the outer roof is timber covered, with waterproof canvas and the ceiling of fibrous boards bent to shape. Accommodation is provided for forty-two first class passengers (six in each of the seven compartments); every compartment is in itself an observation saloon, having a large frameless plate glass window providing an uninterrupted view of the countryside. The side windows are of the drop type, and fitted with the Beclawat locking system, which enables them to be secured in any position between fully open and closed, and are fitted with balance springs to give easy operation; they are rattle-proof, and of non-splintering, toughened safety glass.

Passenger Accommodation

A feature new to South Australia is the provision of double sliding doors to each compartment, giving passengers seated adjacent to the corridor as uninterrupted a view as those on the compartment side. Considerable thought has been exercised in providing seats which give the maximum riding comfort, together with excellent reading facilities. The seats are a combination of the well and loose cushion type. Loose cushions of Latex rubber, suitably upholstered, are supported upon deep sprung foundations, providing a luxury seat of the lounge type, and equipped with arm rests. The seat risers are of steel plate, set well back from the seat front, so as to be unobstructive. Special attention has been given to luggage accommodation and all compartments have adequate luggage racks, comprising an upper rack for heavy articles, and a lower one for hats, papers, &c. A marked departure has been made in the disposition of lights. In addition to the ceiling light, in each compartment four separately controlled reading lamps are built into the luggage racks, and are under direct control of the passengers. These reading lamps are so arranged that there is no glare or interference to the passengers occupying the opposite seat. The ceiling light fittings incorporate a system of exhaust ventilation, which provides ample air ducts leading to the air extractors on the roof of car. The lamp fittings have been specially designed and manufactured at Islington works. The extractors are so arranged that air extraction is efficient in both directions of travel.

Of the seven compartments, four are upholstered in blue chrome leather, and the remaining three (non-smoking) in blue and fawn corded wool repp. Specially designed

mirrors have been fitted, one on each side of the compartment, immediately above the centre seat. Card tables are carried in cabinets in the corridor, and are easily fixed in the compartments when needed. Up-to-date lavatory accommodation is provided at each end of the corridor, and is fitted up with the latest hygienic equipment. The walls are arranged in a tiled pattern to a height of 5 ft., and the whole interior is enamelled white; the floor has been finished in a Terrazo design of black and white.

First-class non-smoking compartment, upholstered in blue and fawn repp

Silent Running

The floor consists of magnesite-cork cement floated on to a galvanised iron foundation; between the seat risers and along the corridor, one layer of sheet cork ½ in. thick is laid upon the cement, and is covered with fibrous sound-insulating board ½ in. thick, providing a suitable surface for a covering of linoleum. Carpets of suitable design, colour, and pattern are provided in the compartments and along the corridor. During the trial run the car was placed next to one of the ordinary passenger cars, and its noiseless and smooth running compared with the old type was freely commented upon. Access to the cars is obtained by commodious end vestibules, and provision is made both for platform and ground loading. A new note has been struck by treating the decoration of the vestibules separately from the car interior. They are finished in a two tone high gloss enamel, and are plain in design, with no projection to gather road dust; cleaning is therefore a simple process. Sliding doors shut off the vestibules from the rest of the car, thus eliminating dust and objectionable running noises from the coupling gear. All the sliding doors are equipped with specially designed and patented door rollers, which are anti-rattle and noiseless, will not stick or jam, and will remain in the open or closed positions notwithstanding running oscillations and vibrations.

The exterior is finished in synthetic enamel; the letter board and lower panels are of a dark green shade, with the intervening portion in cream, and lined in black and signal red. The general decorative scheme of the interior is rosewood panelling on the partititions and side walls; eggshell gloss white for ceilings; with metallic fittings finished in oxidised silver. Iced drinking water fonts are fitted at each end of car. These drinking fonts were designed and manufactured at the Islington works, and after twelve months' trial in service have now become standard equipment on long distance trains, a convenience highly appreciated by the travelling public.

Smoking compartment (blue chrome leather upholstery) showing one of the collapsible card tables erected for use

Underframes and Bogies

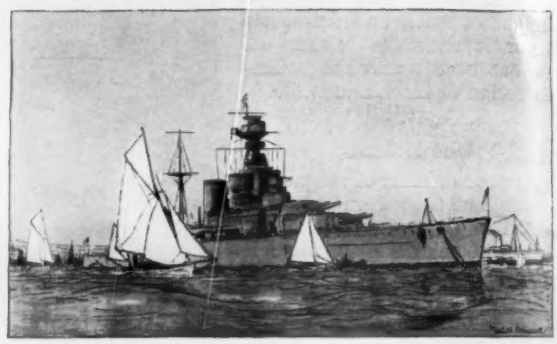
The underframe is entirely welded, with deep centre sills forming the backbone of the car, and a column to take care of the buffing stresses, with cantilevers connected with the car body sides. The usual equipment is carried upon the underframe, including electric lighting plant, water tanks, air brake gear, &c. Large anti-telescopic steel members are attached to the underframe at each end, and connected with the roof; they are completely hidden from view and so do not interfere with the perfectly clean appearance of the ends of the car.

The bogies are of the compensating beam type, and, whilst following more or less conventional design, have several new features to decrease weight, give perfect balance, and easy riding. The bogies are all-welded, using

a combination of rolled steel sections and steel castings. The equalising beams are of H section, in order to reduce to the minimum the unsprung weight and consequent road shocks. The brake gear is of the full equalised clasp type, totally eliminating the objectionable hunting action of bogies due to brake application, common in many existing types of bogies. The bogie bolster is of Duplex design, with outriggers carrying the body supports well outside the bogie side frames, thus providing excellent riding conditions from the passengers' viewpoint. Rolled disc steel wheels replace the old spoke type, thus reducing fanning and dust-raising propensities common to the latter.

The lighting system comprises one Stones Tonum 32-volt generator, connected with two sets of No-Wash batteries, each set comprising sixteen accumulators of seventeen plates, having a total capacity of 640 ampere-hours. The tare weight of the car fully equipped for the road is 41 tons 17 cwt.

H.M.S. "Victory," Portsmouth



H.M.S. "Hood," Portsmouth

Two naval examples of coloured etchings used in Southern Railway carriages. The subject of railway carriage decoration is referred to in a Letter to the Editor on page 312

A Morris Eight chassis equipped by the New Zealand Government Railways for fire-fighting. It has flanged wheels, and runs behind lumber trains with wood-burning engines, to deal with forest fires caused by sparks

Annual dinner of the Eastern Divisional Locomotive Running Superintendent's Department, Southern Railway, held on February 10 at the Strand Palace Hotel *(see page 329)*

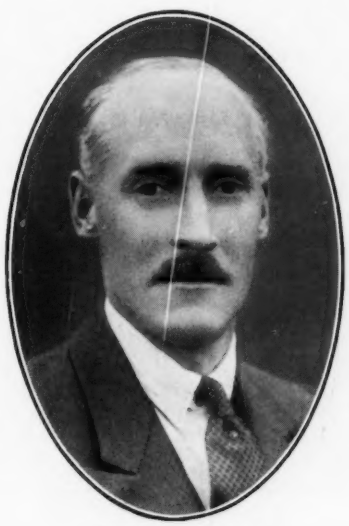
RAILWAY NEWS SECTION

PERSONAL

Mr. T. F. Brennan, Comptroller of Accounts, Victorian Government Railways, retired in December after 47 years' Government service, 30 of them in the Railway Department. When, in 1906, the Government decided to reorganise the accountancy methods of the Railways Department, Mr. Brennan was selected from the Auditor General's staff for the position of Assistant Railways Accountant, and subsequently became Comptroller. In addition to his normal work, which has been conspicuous for its judgment and sagacity in dealing with important problems connected with the largest State undertaking with a capital of £76,000,000, Mr. Brennan has carried out many Government investigations. In 1913 he examined the accounting system of the Tasmanian Government Railways, and in 1930 was a member of the Commission on Public Service Economics; and of the board investigating the State coal mine in the following year. In 1932 he was a member of the special committee appointed to investigate the capital indebtedness of the Victorian Railways, that reported on the transfer of railways capital to the general accounts of the State. For the past 25 years he has been urging the necessity for a Renewals and Replacements Fund, an objective that has now been attained in a Bill providing for the transfer of £30,000,000 of the railway capital to the State and payments annually of at least £200,000 into this fund. The Bill is referred to in our Overseas columns on page 315. Mr. Brennan is a prolific writer on accounting and is a Fellow and Past-President of the Commonwealth Institute of Accountants, and also a Past-President of the Commonwealth Accountants Students' Society, and the Victorian Railways Institute.

Mr. T. F. Brennan,
Recently retired Comptroller of Accounts, Victorian Government Railways

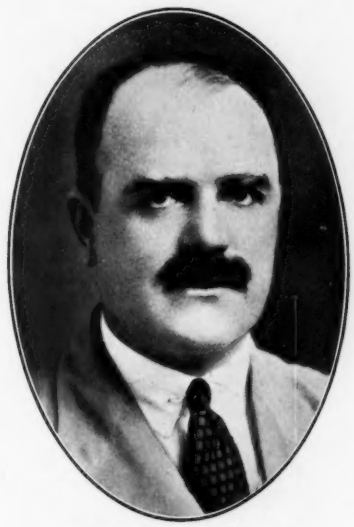
Mr. C. E. Blow has been appointed Chief Accountant of the Southern Railway of Peru. He entered the service of the Peruvian Corporation in September, 1915, and, except during the period October, 1918, to June, 1919, served in the Accounts Department of the Central Railway at Lima. In October, 1933, he resigned his position as Chief Accountant of that railway to take up an appointment in the South American general office of Pan-American Grace Airways Inc. Mr. Blow re-entered the service of the Peruvian Corporation in November, 1936, and now occupies the position of Chief Accountant to the Southern Railway, with headquarters at Arequipa.



Mr. C. E. Blow,
Appointed Chief Accountant, Southern Railway of Peru

At a meeting of the Great Western Railway board of directors on February 12, it was announced that Mr. Arthur Windham Baldwin had been appointed a Director to fill a vacancy. He is also a Director of the Round Oak Steel Works and of Redpath, Brown & Co., Constructional Engineers. Mr. A. W. Baldwin is the second son of the Prime Minister, and his family has been connected with the G.W.R. since January 1901, when Mr. Alfred Baldwin, his grandfather, joined the board and became Chairman of the company in 1905. His father, Mr. Stanley Baldwin, joined the board in October, 1908, and resigned in May, 1917, on his appointment as a Junior Lord of the Treasury.

Mr. V. L. Dean, V.D., M.Inst.T., Indian State Railways, has been selected by the Indian Railway Board for the appointment of Resident Manager, Indian Railways Bureau, New York. Mr. Dean received his early training on the former London & North Western Railway. In 1914 he was appointed by the Secretary of State for India, as Assistant Traffic Superintendent, Indian State Railways, and was posted to the North Western Railway. He officiated as District Traffic Superintendent in 1918, and was subsequently confirmed in that appointment. During the last three years Mr. Dean has been Principal of the Walton Training School (North Western Railway), an appointment he recently vacated to take up his new post. Mr. Dean holds the rank of Major in the Auxiliary Force, India. He is at present on leave in England and sails shortly for the United States of America.



Mr. V. L. Dean, V.D.,
Appointed Resident Manager, Indian Railways Bureau, New York

Mr. J. H. McIlvenna, A.M.Inst.C.E., who, as announced in THE RAILWAY GAZETTE of February 5, has been appointed District Engineer, Darlington, L.N.E.R., as from March 1, served his apprenticeship under Mr. Bell, the Chief Engineer of the former North British Railway, at Edinburgh.

Mr. J. H. McIlvenna,
Appointed District Engineer, Darlington, L.N.E.R.

Mr. F. H. Colebrook, M.C.,
Appointed District Engineer, Hull, L.N.E.R.

In 1907 he was appointed as a civil engineering assistant under the District Engineer at Darlington, where he gained experience on important diversions, bridge renewals, construction of hump marshalling yards and general work. In 1924 he was appointed Assistant District Engineer on the Northumberland District, which then embraced the Tyneside electrified area. In 1931, on the closing of the Northumberland District, Mr. McIlvenna went over to Mr. Harrison, the District Engineer at Newcastle, where he remained until early in 1932, when he was appointed District Engineer at Hull. It is from that position that he now returns to Darlington, a district greatly extended since his previous service there, as District Engineer.

Mr. L. C. Jackson has recently been appointed to succeed Mr. S. J. Page—now Assistant Secretary, Ministry of Transport—as Secretary of the Railway Rates Tribunal. Mr. Jackson was with the former Hull & Barnsley Railway for some time, and served on several of the conferences and committees of the Railway Clearing House, prior to his appointment to the Ministry of Transport in 1919. For some years now he has been Secretary to the Rates Advisory Committee and Assistant to the Secretary of the Railway Rates Tribunal.

Mr. F. H. Dashwood, who, as announced in THE RAILWAY GAZETTE of January 29, has been appointed Principal Assistant to the Stores Superintendent, Great Western Railway, entered the company's service and was posted to the Stores Department in 1896. In 1906 he was placed in charge of the correspondence section, and later, the order section. In 1911 he was appointed Assistant Locomotive Works Storekeeper and in 1918 Storekeeper, Swindon Locomotive Works, which position he held until 1923. He was then appointed Assistant to the Stores Superintendent, the position from which he is now promoted to be Principal Assistant. Mr. Dashwood has gained various successes in accountancy and business organisation and also in commercial and contract law.

Mr. F. H. Dashwood,
Appointed Principal Assistant to the Stores Superintendent, G.W.R.

Mr. R. C. Rattray, B.A., who, as announced in our issue of February 5, has been appointed District Engineer, Western Scottish District, Glasgow, L.N.E.R., was educated at Charterhouse and Cambridge, and holds the degree of Bachelor of Arts in Science (with Honours). He is also an Associate Member of the Institution of Civil Engineers, and is a Miller Prizeman. He served his pupilage with the Engineering Department of the former Lancashire & Yorkshire Railway, and later became an assistant on the Engineering Staff of that company. In 1920 he was appointed Assistant District Engineer for the Guide Bridge District of the Great Central Railway, which position he retained after the amalgamation under the London & North Eastern Railway. In February, 1927, he was appointed District Engineer, Southern Scottish District, with headquarters at Carlisle, and it is from this district that he is now transferred to Glasgow in a similar capacity. Mr. Rattray served in France from 1915 until the termination of the war, when he retired with the rank of Captain, R.E.

Mr. R. C. Rattray, B.A.,
Appointed District Engineer, Western Scottish District, L.N.E.R.

Mr. Gordon S. Inglis, B.Sc., M.C.,
Appointed District Engineer, Southern Scottish District (Carlisle), L.N.E.R.

Mr. F. H. Colebrook, M.C., A.M.Inst.C.E., who, as announced in THE RAILWAY GAZETTE of February 5, has been appointed District Engineer, Hull, L.N.E.R. was educated at Christ's Hospital, West Horsham. In 1906, he was articled to the late Edmund J. Cullis, A.M.Inst.C.E., of Gloucester, and was engaged on dock works, reinforced concrete bridges and structures, and general engineering works. After a short period, in 1910, with Taylor, Wallin and Taylor, Civil Engineers, Newcastle-on-Tyne, Mr. Colebrook joined the former North Eastern Railway as an assistant in the District Engineer's Office, Northumberland District, and was chiefly concerned with bridges, coal shipping staiths and their equipment, and other structural works. He served overseas in commissioned rank in France with the 10th Bridging Train, 560th Company, R.E., 10th, and 296th Railway Construction Companies, R.E., and was awarded the Military Cross; he rejoined the N.E.R. in 1919. From Newcastle he was promoted to a position in the District Engineer's Office, Bishop Auckland, where his principal interest was in the preparation of detailed drawings for permanent way work, and in the supervision of permanent way renewals. In 1924 he moved to Darlington and was afterwards appointed Assistant District Engineer under Mr. J. C. Valentine. He returned to Newcastle in 1927, on his appointment as Assistant District Engineer to Mr. F. E. Harrison, in the Newcastle District, the position he now vacates to take over charge of the Hull District. He is an Associate Member of the Institution of Civil Engineers.

Mr. Gordon S. Inglis, Chief Assistant (Construction), to the Engineer (Scotland), L.N.E.R., who, as announced in our issue of February 5, has been appointed District Engineer, Southern Scottish District (Carlisle), L.N.E.R., was educated at Edinburgh Academy and Edinburgh University, where he graduated B.Sc. (Engineering), in 1912. In the same year he entered the office of the Chief Engineer, North British Railway, as a pupil, and on the outbreak of war two years later, being a member of Edinburgh University O.T.C., was early granted a commission in the Royal Engineers. He went to France in January, 1915, and joined the 1st Division, where he served in the Lowland Field Company. He was appointed Adjutant to the Divisional R.E. in 1916, with the rank of Captain; in 1918 he was transferred to command the 279th Railway Construction Company. He was twice mentioned in dispatches, was awarded the M.C. in 1916, and was demobilised in 1919 with the rank of Major. Mr. Inglis rejoined the North British Railway in 1919 as Assistant to the New Works Section, was appointed Personal Assistant to the Engineer in 1923, and in 1928 was transferred to Glasgow as Chief Assistant to the District Engineer. He returned to the head office, Edinburgh, in 1934, as Chief Assistant (Construction), which post he now vacates to take up his new appointment at Carlisle.

It is announced by the London & North Eastern Railway that Mr. R. Pattison has been appointed Assistant for Overhead Equipment on its electric traction staff. Mr. Pattison has been on the staff of Messrs. Merz & McLellan, Consulting Engineers, Westminster, for over twenty years, and during this time he has been engaged on the design and installation of overhead line equipment and high tension transmission lines, in connection with the suburban electrification of the Victorian Railways at Melbourne, Australia, and the main line electrification of the South African Railways in Natal and the Great Indian Peninsula Railway in India, and has spent considerable periods in each of these countries. Mr. Pattison has recently been representing Messrs. Merz & McLellan at Norwich in connection with a portion of the Central Electricity Board's East England Scheme.

G.W.R. APPOINTMENTS

The following appointments are announced by the Great Western Railway:—

Mr. H. G. Lakeman, Assistant, Port Talbot Docks (Engineering Dept.), to be Assistant, Cardiff Docks (Engineering Dept.).

Mr. T. W. Smith, Chief Parcels Clerk, Cardiff, to be Stationmaster, Swansea, High Street.

We understand that Mr. F. H. Cave has been appointed to succeed Mr. A. Foulkes as Chief Traffic Manager, Mersey Docks and Harbour Board.

We regret to announce the recent death, in his 82nd year, of Mr. Cyril Plummer, Solicitor, and for many years with the Great Western Railway.

From *The London Gazette* of February 12: Territorial Army; Royal Engineers; Engineer and Railway Staff Corps: Lt.-Col. C. J. Brown, C.B.E., T.D., M.Inst.C.E., resigns his commission and retains his rank, with permission to wear the prescribed uniform (February 13).

S.R. Locomotive Running Department Dinner

The twelfth annual dinner of the Eastern Division of the Locomotive Running Department, Southern Railway, took place on February 10 at the Strand Palace Hotel, under the chairmanship of Mr. D. Sheppy, Eastern Divisional Locomotive Running Superintendent. Among those present were:—

Messrs. F. C. Bishop, O. Cromwell, A. Cobb, J. Clayton, T. E. Chrimes, W. J. England, G. H. Hare-Dean, M. Hatchell, G. Humfress, W. Marsh, J. L. Moore, A. B. MacLeod, J. Masterton, P. Nunn, H. E. Robarts, G. H. Snow, A. White, and W. A. Willox.

Mr. J. Clayton, proposing the toast of "The Locomotive Running Department," pointed to the record attendance at the dinner as symptomatic of the vitality of the steam locomotive, despite the progressive encroachments on its domain by electrification. The steam locomotive, he said, went up with the *Rocket*, but it had certainly not come down with the stick, for notwithstanding its new rivals it was still the most economic prime mover. If only it were practicable to scrap all locomotives over 20 years old and replace two-thirds of their number with up-to-date engines incorporating all the latest refinements, astonishing results could be shown. Indeed, given good conditions all round, including first class permanent way and signalling, there was no practical limit to what steam could do. Mr. Clayton paid a tribute to the Locomotive Running Department, and instanced its successful working by quoting the figure of 127,000 miles per engine failure which had been achieved last year.

Mr. A. Cobb, Locomotive Running Superintendent, responding to the toast, thanked Mr. Clayton for the very friendly and helpful attitude the Chief Mechanical Engineer's Department always assumed towards the Locomotive Running Department. His relations with the Traffic Department were not less fortunate, and as these two departments were very closely associated with locomotive running he wished it to be known that any success achieved by the latter was in no small measure due to their help. Mr. Cobb expressed appreciation of what Mr. Clayton had said about the vitality of the steam locomotive, and wished he could be given the opportunity on the Southern of showing what Southern engines could do with limited-load high-speed trains, such as were now being introduced on the other main line railways. Mr. Cobb concluded by taking the opportunity of thanking the staff of the Locomotive Running Department who had so loyally and efficiently supported him during the past year.

Mr. D. Sheppy read a letter he had received from Mr. A. D. Jones, whose premature retirement from the post of Locomotive Running Superintendent owing to ill health they all so much deplored. Mr. Jones wished them well, but regretted that his health was not yet sufficiently restored to enable him to be present. Mr. Sheppy expressed the appreciation of those present for the excellent arrangements of the dinner and the entertainment which followed it. A vote of thanks was passed to the Dinner Committee, whose Chairman, Mr. Lelew, and Secretary, Mr. Hall, deserved special congratulations.

Transport in Germany

Abstract of a paper by Brig.-General Sir H. Osborne Mance, presented on Tuesday to the Institute of Transport

The German railways were built partly as State railways by the many different States existing before the unification of Germany, and partly as private railways. As regards Prussia, the railways in the richer and more developed districts were originally private railways, and the State had to undertake building lines in the poorer districts, chiefly east of Berlin. After the formation of the German Empire, Bismarck tried to acquire all the railways of the Empire as a single unit, but the opposition of the States prevented this and led to some of the States taking over their private railways.

Bismarck then arranged during the following years for the Prussian Government to take over the private railways in Prussia and consolidated the whole of the Prussian railways into a State railway system. The reasons given were partly military and partly based on the need to improve by unification the efficiency of the railways which was then at a low ebb and the subject of many complaints. The Prussian railway unit thus formed was so much more important than any of the other German railways that in fact it was able to dictate German railway policy as a whole.

On April 1, 1920, under the provisions of the Weimar Constitution, the various State-owned railways were amalgamated into a single system, operated by the Central Government. In November, 1923, the combined system was reorganised into a commercially managed unit, independent of the Government budget, as one of the measures necessary for the stabilisation of the German currency. The status of the new undertaking, known as the Reichsbahn, was confirmed on February 12, 1924.

In October, 1924, under the Dawes plan, the German State Railway Company was formed under a scheme which provided that a substantial proportion of Germany's reparation payments should be found from the net revenue of the Reichsbahn, the capital charges of which had been wiped out by the inflation, and from the transport tax on the traffic of the German railways. In 1930, when the Dawes plan came to an end, the railways practically became State railways though still administered with a separate budget and financial autonomy by a board nominated by the German Government.

Up to 1933 the organisation of the Reichsbahn into local district managements was based mainly on the political boundaries of the different States. There were 30 such districts all of which reported direct to headquarters, except six in Bavaria which were grouped for administration. These territorial divisions have lost their special significance and at present the Reichsbahn is divided into 27 districts, shortly to be reduced to 26.

As regards the private railways, the German Government has taken over the rights of expropriation previously held by the States. No date for expropriation was specified and, in fact, the private railways, with a few special exceptions, have not been taken over, but quite recently the Minister of Posts and Transport expressed the view that the State or the Reichsbahn might take over the private railways gradually on equitable terms. The Reichsbahn has the first right to all new railway construction of general interest.

Special Charges Borne by Railways

The Reichsbahn has to bear certain charges for personnel which do not fall on their competitors and which owe their origin largely to political causes. Due to the compulsory inflation of personnel at demobilisation, partly owing to the absorption of railway refugees from ceded areas (see Fig. 1), the *extra* annual cost of pensions involved by the subsequent reduction of personnel was calculated to be £11,300,000 in 1930. It was estimated that this cost would continue to rise till 1946, after which it will diminish. Moreover, changes in the categories of employees for political reasons have resulted in an extra annual cost of £3,150,000.

All traffic on the railways, including the private railways (except coal, railway service traffic and military traffic, which are free of tax), has to bear a transport tax varying from 7 per cent. to 16 per cent., and amounting on the lines of the Reichsbahn to over £16,000,000 in 1929 and to £10,800,000

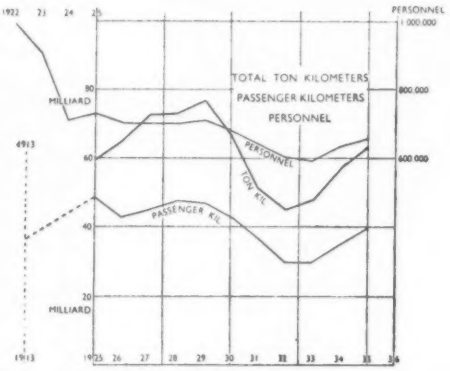


FIG. 1

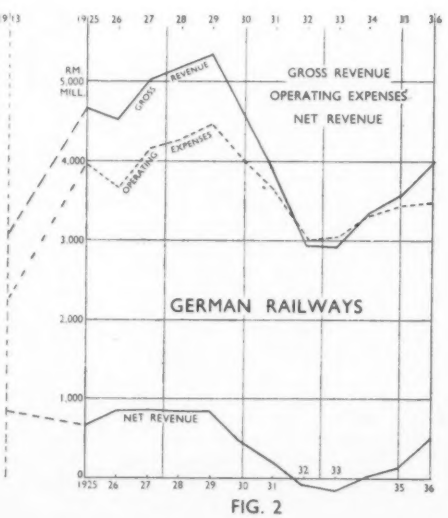


FIG. 2

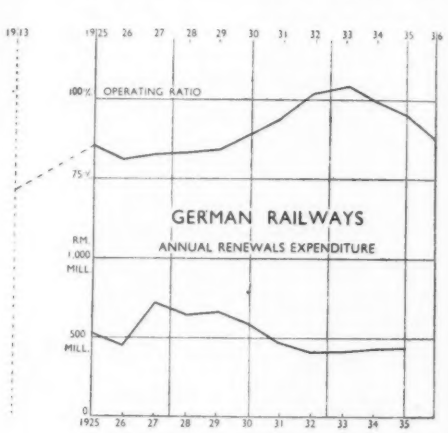


FIG. 3

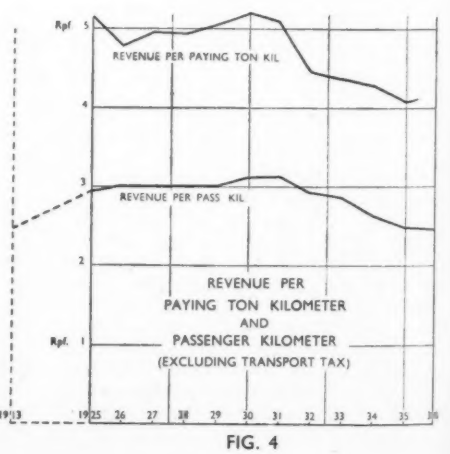


FIG. 4

in 1935. The transport tax on railway traffic in 1913 amounted to £1,890,000. Moreover, apart from meeting transport requirements, the railways are regarded as an instrument for providing employment, not only by granting specially reduced rates to help employment schemes, but by placing orders for materials and rolling stock and undertaking works involving direct employment beyond commercial railway requirements. Some 62,000 temporary summer workers were given employment on these grounds throughout the winter of 1933; 30,000 in 1934; and 15,000 in 1935.

The accompanying graphs (Figs. 1, 2, 3 and 4) show the development, since 1925, of gross revenue, operating expenses, net receipts, operating ratio, renewals expenditure, ton kilometres, passenger kilometres, personnel employed; revenue per ton and passenger kilometres (excluding transport tax). There is no renewals fund, and annual renewals expenditure shown in the graph is included in the operating expenses.

The Remarkable Railway Recovery

The recovery in traffic and receipts during the last two years has been remarkable. Ton kilometres have increased in 1935 by 11·4 per cent. over 1934 and 32·9 per cent. over 1933, the corresponding figures for the English railways being 1·2 per cent. and 9·2 per cent. The increase in the number of passengers for the same period was 9·5 per cent. and 20 per cent. respectively, as compared with 2·5 per cent. and 6·25 per cent. in this country. These differences may be due in part to the exceptionally low level of traffic on the Reichsbahn during the crisis of 1931-1933. Still further increases are recorded for 1936 which considerably exceed the English percentages, and, for the first time since 1929, the net operating revenue of the Reichsbahn has covered all the charges with a balance for reserves. There has been an increase in the receipts per ton kilometre in 1936 due to an increase in tariffs of 5 per cent. as from January, 1936. Certain exceptions were made and certain alleviations were effected from October 1, 1936, so that the net result of the 5 per cent. increase in tariffs was an increase of 1·8 per cent. in the average revenue per total ton kilometre.

Electrification

Considerable lengths of the railways have been electrified in recent years, the electrified kilometrage, which was only 142 in 1913, having increased from 940 in 1925 to 1,600 in 1932 and 2,172 at the end of 1935. At present the Nuremberg-Halle section (part of the line from Munich to Berlin) with a branch to Leipzig, in all some 350 kilometres, is being electrified. In principle, every scheme for electrification is carefully examined to determine whether the expected savings in operating costs will cover with a margin the interest on the new capital required.

Inland Waterways

Inland water transport is the second largest means of transport in Germany. The importance of the natural waterways is evident from the fact that on the lower Rhine vessels of 4,000 tons capacity can pass up to Cologne and of 1,200 tons capacity, at present, up to Basle; on the Elbe and its tributary the Moldau, vessels of 1,000 tons can pass to Prague, while on the Oder vessels of 700 tons serve Breslau. The flat country and the resulting fewness of locks facilitate the construction of high capacity canals, the standard unit being now raised from 600 to 1,000 tons. A notable exception is the canal connecting the Rhine with the Danube, which at present has a limited capacity for vessels up to 100 tons only.

A great deal of traffic goes partly by rail and partly by water and one of the burning questions before and after the war was that of railway rates for such traffic as compared with the all-rail route. The State capital represented in the inland waterways of Germany is roughly 2½ milliard Marks, which is free of capital charges. The annual Government expenditure on the maintenance and improvement of inland waterways amounts to 160,000,000 Marks and the annual revenue to 30,000,000 Marks. Generally speaking, no charges are levied on shipping on natural waterways, but on canals charges are levied varying with the nature of the traffic.

Road Transport

In October, 1931, by an Emergency Decree, licensing was introduced for road motor goods transport operating over 50 kilometres, except ancillary traffic. Motor transport rates were prescribed corresponding to the higher class rates on the railways and, as a counterpart, the railways had to discontinue their special competitive rates. This legislation failed owing to the impossibility of effectively controlling the charges of road transport operators. In June, 1935, therefore, a law was passed under which all goods transport operators (except ancillary users) working outside a radius of 50 kilometres were obliged to join a public corporation known as the Reichs-Kraftwagen-Betriebsverband, which was formed in October, 1935. Rates are fixed in agreement between the Reichsbahn and this corporation, with the approval of the Minister of Transport. All payment for transport is made by users direct to the corporation and not to the operator. The corporation makes some deduction for expenses and retains certain of the charges for developing non-paying services.

The first road transport tariffs under this Act came into force on April 1, 1936. They were based closely on the four higher classes of the railway goods tariff, with permission to use three lower classes by agreement between the Reichsbahn and the corporation in cases where this is necessary to obtain complete loads. In addition to the standard tariffs, about 100 railway exceptional tariffs are also taken over for road transport. The distinction between short distance and long distance transport would seem to be broadly justified as a rough and ready division of function. At present all one can say is that the practical application of a scheme based on this distinction is more likely to prove workable in Germany than in Great Britain. In cases where road transport is allowed to provide an alternative service for traffic normally appertaining to the railway, the German system seems to be directed simply to raising road charges to equal railway charges.

The total number of vehicles involved in long distance road transport for payment is not so great as might be expected, namely, 12,000 excluding trailers, in the hands of 9,000 owners. Of these vehicles, 2,000 are furniture vans which are conditionally excluded from the arrangement, and apparently the owners of a large number of vehicles have decided not to continue long-distance work but to try the harder job of earning a living on short-distance work, so that at the beginning only some 6,000 to 8,000 vehicles, mostly of high capacity, are involved.

It is recognised in Germany that no system of co-ordination involving independent road transport will work unless the operators are unified under far-reaching control of a single organisation. If the system now on trial in Germany does not work in spite of the comparatively small number of road vehicles involved, it will be a small step to a combined road and rail monopoly for all long-distance public land transport.

A Record Travel Year.—With the issue of the Home Office figures, the Travel Association is now able to give a complete statement of the number of visitors to the British Isles from other countries during 1936. It was a record-breaking year. The following table shows the totals of holiday and business visitors who came in 1936, in 1935, and during the peak year of 1930—

	1936	1935	1930
Holiday	267,305	227,768	245,865
Business	102,369	87,990	87,950
Combined total	369,674	315,758	333,815

The number of holiday visitors in 1936, therefore, shows an increase of 39,537 over that of 1935, and 21,440 over that of 1930. Every month last year showed an increased number of visitors compared with 1935. These figures do not include overseas British visitors who travel with British passports and are not recorded at the ports; they are estimated at 200,000. Nor do they include the 50,000 or so week-end and day excursionists who came from France and Belgium with "no-passport" facilities.

Railway Companies and Profit-Sharing

(*See editorial article on page* 308)

In the issues of our constituent *The Railway News* for September 30 and October 7, 1911, two articles were published dealing with the possibilities of applying a profit-sharing or co-partnership scheme to the British railways. The system, which was an elaboration of one first propounded in *The Railway News* in April, 1897, recognised the impossibility of devising a single plan applicable to all railway companies, and therefore the first article dealt only with companies which paid dividends in full on all capital stocks ranking in priority to ordinary stocks for the years 1907, 1908, and 1909, with the object of applying the proposals to the accounts of such companies for 1910. The L.N.W.R., Midland Railway, G.W.R., and N.E.R. were selected examples for examination, and the G.E.R. and L.Y.R. were added in order to show the adaptability of the scheme to companies other than those standing in the front rank of dividend payers.

In the first place it was laid down that no contribution should be made to a profit fund, that is the fund to be distributed between capital and labour, until ordinary working expenditure had been defrayed and obligations met, and a reasonable rate of interest paid to capital. It was suggested that the amount to be deducted from revenue in respect of interest upon capital should be the amount of dividends actually paid upon all capital stocks ranking in priority to the ordinary stock for the year under review, together with interest upon the nominal value of the ordinary stock at a rate equal to the average annual rate of dividend paid upon such stock for the three years preceding the year under review, to the maximum of 5 per cent. Amounts placed to the credit of general reserve were, of course, not to be deducted from the profit fund, and likewise depreciation was to be charged to revenue.

In arriving at the amount of the profit fund for a particular year, the differences between the amounts paid to the credit of, and charged to, general unearmarked reserve funds upon the average of the three preceding years should be added to, or deducted from, the amount of dividend paid upon the original stock of the company for such years, before deducting such sum from the amount available as a profit fund, according as such dividends had been diminished by, or increased by, such differences, with the proviso that the rate of dividend employed for such deduction should not exceed 5 per cent. cent.

It was an important feature of the scheme that the amount paid out to the employees, whose claims on the fund were in proportion to wages or salaries received, in any one year should not deplete the profit funds of the preceding year, that is, the employees' share of the profit fund should be paid out of profits and not be treated as a charge on profits. Further, it was proposed that the scheme should be limited to members of the staff actually engaged in the movement of traffic. This was considered important, as the wages of mechanics and others were ruled by conditions prevailing in the engineering industry generally. The method of distribution of the fund should possess the attributes of (*a*) facility in the ascertaining of the basis of division, (*b*) the indisputability of the basis, (*c*) facility of application. The basis of division, it was deemed, was best fixed by taking the proportions which the interest on paid up capital and the amount of wages paid bore to their sum. The amount of the profit fund and its distribution could be settled by the companies' auditors, whose certificate would be final.

The scheme as applied to the accounts of the six selected companies

TABLE I.—PROFIT FUND, COMPANIES WHICH PAID DIVIDENDS ON ORDINARY STOCK.—YEAR 1910

	L.N.W.R.	N.E.R.	Midland	G.W.R.	G.E.R.	L. & Y.R.
	£	£	£	£	£	£
Gross receipts	15,922,697	10,472,058	12,653,141	14,132,808	6,087,338	6,077,932
Deduct—Working expenditure	9,936,639	6,677,121	7,716,665	8,839,758	3,800,050	3,638,952
	5,986,058	3,794,937	4,936,476	5,293,050	2,287,288	2,438,980
Add—Divs. on investments, bank interest, &c.	160,509	8,994	388,242	37,083	12,961	17,205
	6,146,567	3,803,931	5,324,718	5,330,133	2,300,249	2,456,185
Deduct—Rents of leased lines, &c.	280,462	105,148	98,927	386,733	240,713	31,830
	5,866,105	3,698,783	5,225,791	4,943,400	2,059,536	2,424,355
Deduct—Interest on debenture stock	1,105,627	711,853	1,035,206	1,358,812	793,877	596,935
	4,760,478	2,986,930	4,190,585	3,584,588	1,265,659	1,827,420
Deduct—Dividends on guar. and pref. stocks	1,718,962	983,254	1,852,105	1,493,062	773,608	1,003,292
	3,041,516	2,003,676	2,338,480	2,091,526	492,051	824,128
Deduct—Interest at the above-mentioned rates per cent. per annum on ordinary stock	5% (maximum) 2,144,423	5% (maximum) 1,588,433	5% (maximum) 1,947,501	5% (maximum) 1,804,875	$2\frac{7}{12}$% 396,875	$3\frac{7}{8}$% 729,332
PROFIT FUND	897,093	415,243	390,979	286,651	95,176	94,796
Basis of allocation of profit fund :—						
Company—Divs. on debenture and pref. stocks	2,824,589	1,695,107	2,887,311	2,851,874	1,567,485	1,600,227
Interest at 5 p.c. per annum on ord. stock	2,144,423	1,588,433	1,947,501	1,804,875	768,144	941,074
	4,969,012	3,283,540	4,834,812	4,656,749	2,335,629	2,541,301
Employees—Amount of wages paid to those entitled to participate—Year 1910	2,942,840	1,822,695	2,904,249	2,408,598	1,081,658	1,241,771
	7,911,852	5,106,235	7,739,061	7,065,347	3,417,287	3,783,072
Company's share of profit fund	563,416	267,020	244,256	188,931	65,050	63,680
Employees' share of profit fund	333,677	148,223	146,723	97,720	30,126	31,116
equal to—	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Per cent. per annum of ordinary stock	0 15 7	0 9 4	0 7 6	0 5 5	0 3 11	0 3 4
Per cent. of wages paid	11 6 9	8 2 8	5 1 1	4 1 2	2 15 8	2 10 1
Actual div. paid on ord. stock—Year 1910	6 12 6	6 0 0	6 0 0	5 15 0	3 2 6	4 7 6
Total profit fund per cent. of ordinary stock	2 1 10	1 6 2	1 0 0	0 15 11	0 12 4	0 10 1
Company's share " " "	1 6 3	0 16 10	0 12 6	0 10 6	0 8 5	0 6 9
Employees' share " " "	0 15 7	0 9 4	0 7 6	0 5 5	0 3 11	0 3 4

paying dividends on their ordinary stocks for the year 1910 is shown in Table I.

The second article, dealing with companies which were paying no dividends on their ordinary stocks, took as examples the Cambrian Railway, L.C.D.R., G.C.R., and S.E.R., although the last named company paid, in fact, a small ordinary dividend in 1910. It was suggested that in these and similar cases the profit fund should be arrived at in precisely the same manner and subject to the same descriptions of charges as the profit funds of the Great Eastern, and Lancashire & Yorkshire Railway companies in the first article. While, however, in the cases of the last-mentioned companies the full dividends upon all the preference stocks for the year 1910 and the average annual dividends for the three preceding years upon the ordinary stock were charged against the revenue, in the case of the companies failing to pay ordinary dividends, the *full* dividend upon only those preference stocks which received dividends in full for the three preceding years were charged against the revenue—the dividends upon the remaining prior stocks being brought into charge at the average rate actually paid for the three preceding years.

In the cases under review, the company's share should, it was thought, be based upon the full interest upon all capital stocks ranking in priority to the ordinary stock—whether the dividends were fully paid or not—and 2½ per cent. per annum upon the ordinary stock. It was pointed out that it might be urged that as the ordinary stock of these companies had received no dividends during the three preceding years, it should not be brought in to swell the companies' shares of the profit funds. It was shown, however, that it would be very unreasonable to exclude the claims of ordinary stock (provided by the capitalist for the construction of the railway) when dividing the funds. Whereas it was suggested that the employees should be encouraged to invest their shares of the funds in the ordinary stocks of the companies paying dividends on such stocks, it would not be possible to suggest this for those companies defaulting in their payments on ordinary stock until the scheme began to bear fruit in the shape of ordinary dividends. The scheme as applied to the four selected companies failing to pay dividends on their ordinary stocks is shown in the table below.

TABLE II.—PROFIT FUND, COMPANIES WHICH PAID NO DIVIDENDS ON ORDINARY STOCK.—YEAR 1910

	Cambrian	L.C.D.R.	G.C.R.	S.E.R.
	£	£	£	£
Gross receipts	328,455	*776,807	4,528,995	†1,255,929
Deduct—Working expenditure	200,444	11,802	2,962,989	47,998.
	128,011	765,005	1,566,006	1,207,931
Add—Dividends on investments, bank interest, &c.	—	10,992	274,904	175,751
	128,011	775,997	1,840,910	1,383,682
Deduct—Rents of leased lines, &c.	1,437	49,091	216,200	90,543
	126,574	726,906	1,624,710	1,293,139
Deduct—Interest on debenture stock	106,434	441,860	864,274	406,202
	20,140	285,046	760,436	886,937
Deduct—Dividends on guaranteed and preference stocks	—	—	585,876	533,050
	20,140	285,046	174,560	353,887
Average for years 1907, 1908, 1909	1½%	3⅛%	{4⅛% 1881 pref. 1⅜% 1889 pref.}	2 7/12%
Deduct—Interest at the above-mentioned rates per cent. on the following stocks :—				
"D" debenture stock	7,613	—	—	—
Arbitration preference stock	—	213,033	—	—
1881 5 per cent. preference stock	—	—	57,500	—
1889 4 per cent. ,,	—	—	25,000	—
Total ordinary stock	—	—	—	259,614
PROFIT FUND	12,527	72,013	92,060	94,273
Basis of allocation of profit fund :—				
Company—Dividends on debentures & preference stocks	203,524	783,720	1,823,350	939,252
Interest at 2½ p.c. per annum on ordinary stock	35,536	281,482	273,346	—
Do. at 5 per cent. do. do.	—	—	—	502,479
	239,060	1,065,202	2,096,696	1,441,731
Employees—Amount of wages paid to those entitled to participate—Year 1910	68,190	344,124	1,044,517	495,204
	307,250	1,409,326	3,141,213	1,936,935
Company's share of profit fund	9,747	54,429	61,448	70,171
Employees' share of profit fund	2,780	17,584	30,612	24,102
equal to—				
Per cent. per annum of :	£ s. d.	£ s. d.	£ s. d.	£ s. d.
"D" debenture stock (non-cumulative 4 per cent.)	0 11 0	—	—	—
Arbitration preference stock (4½ per cent.)	—	0 5 3	—	—
1891 preference stock (4 per cent.)	—	—	1 7 5	—
Undivided ordinary stock	—	—	—	0 4 10
Deferred ordinary stock	—	—	—	0 9 8
Per cent. of wages paid	4 1 6	5 2 2	2 18 8	4 17 4
Actual dividends paid, year 1910, on :—				
"D" debenture stock (non-cumulative 4 per cent.)	2 10 0	—	—	—
Arbitration preference stock (4½ per cent.)	—	3 15 0	—	—
1891 preference stock (4 per cent.)	—	—	2 0 0	—
Undivided ordinary stock	—	—	—	3 10 0
Deferred ordinary stock	—	—	—	1 0 0

* 41 per cent. of the net receipts of the Managing Committee, plus rents of property (net), &c.
† 59 per cent. of the net receipts of the Managing Committee, plus proportion of Eastbourne traffic, rents, hotels, &c.
‡ Directors' fees, salaries, and office expenses.

Special Events Traffic

Addressing a recent meeting of the Railway Students' Association of the London School of Economics, presided over by Col. H. H. Mauldin (Traffic Superintendent, Eastern Area, L.N.E.R.), on "Special Events and Their Demands Upon the Railways," Mr. J. E. Sharpe (London West Divisional Superintendent, Southern Railway) defined such events as varying from those that could be met by merely adding a few special trains to the ordinary service, up to the big event necessitating a complete recasting of services. The volume of the traffic was estimated in two or three ways, according to the type of event.

In the case of regular race meetings, for instance, it was known that the attendance from year to year did not vary much. Similarly the traffic to the international Rugby matches at Twickenham was fairly constant, and the programme of trains was based on previous experience. It was important, therefore, to keep accurate records of the traffic on each occasion so that proper provision could be made for subsequent similar events. Special traffic working could, unless carefully watched, result in a serious waste. With league football matches the estimate was not quite so easily obtained, as much depended on the position of the team in the league table and the appeal to popular sentiment of the visiting team. The railway operator had in such cases to use his judgment, guided by previous records, as to what accommodation must be provided. In the case of exceptional events, such as a naval review,* or the docking of the *Queen Mary*, valuable data was obtained by the Commercial Department in the various enquiries received from shipping companies, tourist agencies, and from firms organising their own works outing to the event. From these and the comments of the press the operator formed his judgment as to the number of trains which would be required.

There were other events such as the Schneider Trophy races and the visit of the *Graf Zeppelin* to Hanworth aerodrome, for example, for which there were no precedents, and in these cases the railway operator had to use his own judgment, guided by whatever information he could glean from the promoter and the press, neither of which were too reliable. In every case close attention had to be paid to current events which by reason of their counter attraction might affect the attendance at the event for which arrangements were being made.

Mr. Sharpe then described the arrangements made for the Aldershot Tattoo on June 13 last year, which were the heaviest yet compiled for that event and which presented some interesting problems. The programme provided for 61 special trains inwards and 61 outwards, and these trains were distributed over four stations. Fleet received trains from the West of England and from the G.W.R. system via Basingstoke; those at North Camp came from the G.W.R. via Reading; Aldershot Government Siding handled the trains from London, and the L.M.S.R. and L.N.E.R. via Kensington and Clapham Junction; and Aldershot Town dealt with those from the Central, Eastern and Southern Divisions, together with the eight specials for Colonel Baldwin Webb's party from Wellington, Shropshire. As the trains arrived, a man with a megaphone was posted at the station exits and announced "Your return train leaves from this station No. —— platform at —— a.m." In addition posters were prominently displayed giving the information, so that there was little excuse for a passenger going astray.

The Tattoo performance finished punctually on the stroke of midnight, and by 12.5 a.m. there was a general exodus of over 70,000 people from the arena, so that the roads and footpaths were very quickly blocked with moving people, cars, coaches and buses, all anxious to be on their way home. To meet the competition of the road the railway company was, therefore, faced with the problem of getting the passengers home as quickly as possible.

North Camp station was four miles from the arena and, although one train left at 1.0 a.m. and a local at 1.12 a.m., the real homeward movement started at 1.30 a.m., from which time trains left at regular intervals of eight minutes. With a crowd of such huge dimensions it was essential to allow a sufficient margin for the passengers to reach the station, particularly when the train was going a long distance. If the trains for the return working from North Camp were left stabled at Guildford, Shalford or Godalming Goods, they would have quite a good run to perform before being available for loading and would have to traverse a junction already being used by another stream of return traffic. Arrangements were therefore made for the up and down lines between Aldershot South Junction and North Camp station to be closed after ordinary traffic ceased (11 p.m. in the case of the down line and 11.45 p.m. for the up line), and for those tracks to be used for the berthing of trains required for the return working from North Camp.

At Aldershot Government Sidings 15 trains, including the dining car trains from Waterloo, were dealt with. Government Siding station was used by permission of the War Office. It consisted of one large island platform served by a line on each side, two docks in the centre at the east end and a siding on the north side, known as the Ordnance road. The station was approached by a double line from the junction with the main line at Aldershot Government Siding signal box. Internal sidings known as the Hay Yard and Hay Yard Extension, accommodated four trains. There was no signalling installed between the junction and the station, and the movement of trains was controlled by means of the telephone and hand signals. The empty trains, with the exception of a dining car train in No. 2 platform road, one train in the Ordnance road, and four in the Hay Yard and Hay Yard Extension, were berthed at Woking, Frimley and other places.

Examining next the working at Aldershot Town, Mr. Sharpe explained that the station had one up platform and a down island platform. The inwards working at this station, and also at Government Siding, North Camp and Fleet was governed to a great extent by a ruling of the tattoo authorities, that no train carrying passengers who had not already obtained a ticket of admission to the tattoo must arrive later than 7 p.m. Aldershot Town was scheduled to receive 26 trains, including eight for Col. Baldwin Webb's party. With a steady inwards movement it was desirable to dispose of the empty trains in the same direction so as to avoid shunting delays, and, therefore, with the exception of the five trains which could be berthed at Aldershot Town, some empties were run forward to Farnham and Alton. These stations, however, could not take the whole of the trains. It was therefore decided to cancel the last booked service over the single line from Farnham Junction through Tongham to Ash Junction, conveying the two or three passengers by road, and use it as a stabling ground.

Thus it was that quite a large amount of special traffic could be handled with relatively small facilities when properly organised. There was also, however, the problem of sorting passengers for the various trains. The up platform at Aldershot Town, for example, was quite adequate for the normal business of the town, including large troop movements, but it was obviously impossible to allow everybody direct on to that platform as they came away from the tattoo. The railway company was fortunate, therefore, in having a large goods yard at Aldershot Town with wide roadways, on the surface of which were painted white lines within which to form eight queues. At the head of each queue there was a post on which a notice was hung showing the time of the train and the stations at which it would call. The tickets of the passengers were examined at a barrier erected at the goods yard entrance, and they were then directed to their respective queues.

Special events presented freight as well as passenger problems. For instance agricultural shows involved the transport of large numbers of prize

* A description of the methods adopted for King George V's Silver Jubilee Naval Review appeared in THE RAILWAY GAZETTE for July 19, 1935.

beasts. The work started with a study of the show entry schedule as soon as it was available, and every exhibitor was canvassed by the railway company serving his farm or establishment for the traffic. As the information came in it was tabulated, and in due course the company working the station at the city or town where the show was held convened a meeting of all companies. At this the timetable was discussed.

The preliminary work by the staff of the receiving company involved a study of the facilities available for dealing with cattle, such as loading docks, lighting, water, drainage, and agreement with local authorities as to routes for loaded and empty road vehicles to and from the show ground. The distance of the show ground from the station was an important factor, as upon it depended to a large extent the speed with which road vehicles would be turned round, and this dictated the amount of road plant such as floats for cattle, lorries for pigs and tractors for sheep vans which would be required. These circumstances combined determined the intervals at which trains could be accepted, and their vehicle length would be governed by the loading dock or docks available.

To facilitate the return traffic it was customary for a card to be made out for each vehicle. The trains clerks of the various companies were invited to attend a few hours before the full meeting. Each clerk was then given the cards of the traffic destined for his company and asked to sort them into the order in which he would require the train to arrive at the handing over point. When all the cards had been sorted into trains, lists were prepared for the marshalling staff. At the subsequent meeting the chairman, with a list of times, allocated the particular roads to certain streams of traffic.*

MINISTRY OF TRANSPORT ACCIDENT REPORT

Harpham Crossing, L.N.E.R. November 15, 1936

As a motorcar was crossing the line at about 11.27 a.m., it was struck by the 10.40 up express, Scarborough to Hull, travelling at about 55 m.p.h., and wrecked. Its driver, a Mr. Gee, and his son, aged 12, were killed. The train was not derailed. Weather was fine.

Col. A. C. Trench conducted the inquiry.

The line is double and the crossing is on the skew. The road is a minor country one, and a stranger might assume it to be a farm road. There are 15 ft. gates, opening away from the railway, having ordinary spring catches and locks operated by a railway key, but the one on the west side, by which the motorcar approached, was broken. There are also wicket gates, not locked, for cyclists and pedestrians. There is a gatehouse on the north-west side, and tests showed that it takes approximately 70 sec. for the gate keeper to leave the cottage, operate the gate board, and open the gates in the proper order. The gate board is a signal formed of a red board, which can be turned at right angles to the line, as a warning in both directions, with a lamp having red and green lenses. Owing to hedges, trees, a bank, and the gatehouse, visibility is much interfered with, but, in either direction, a motorist can, after passing a gate, clearly see up and down the line for some distance while still clear of the tracks.

The up advanced starting signal for Burton Agnes, which was "off," is 160 yd., and the down distant 330 yd., away, both visible from either side of the crossing. The gate keeper has three-position indicators in the block circuits and a repeater block bell. The block section, it being Sunday, was from Bridlington to Nafferton, about 9½ miles.

Mr. Gee was accompanied by a Mr. Herbert, and was not pressed for time. They had been directed to take the road via the railway crossing, and at the west gate Mr. Gee asked Mr. Herbert to open it, and did not sound his horn, presumably thinking it an occupation crossing. Mr. Herbert opened the gate, and Mr. Gee drove through. Mr. Herbert was closing the gate, with his back to the line, when he heard the collision. He had not heard any whistle or noise of a train. Anyone opening the gate is cut off from the line, and Col. Trench thinks Mr. Gee could not have thought that Mr. Herbert had looked along it. The car windows were closed, but there was good visibility all round.

Mrs. Dalton, a sub-ganger's wife, in charge of the crossing for 17 years, knew the train would be due in 7 or 8 minutes from hearing the bell signal, and had seen nothing waiting 3 or 4 minutes before it was due, nor did she hear or see the car till it was passing her porch and going on the line. She called to her husband, and the collision occurred. The car had not stopped inside the gate.

Driver Kingdom sounded his whistle at Burton Agnes and saw nothing of the car, but Fireman Bryant did so as it was almost in front of the engine, and shouted to him. To avoid risk of derailment he stopped the train without a full brake application in 860 yd.

Until August, 1936, there were no locks on the gates, and some persons would open them themselves and not call the gate keeper. In November, 1935, some cattle got on the line and were struck by a railmotor, after which the Minister of Transport suggested locks, controlled by the gate keeper, which were fitted in August, 1936. On October 30, 1936, one was found to have been broken by someone who has never been traced, and Mrs. Dalton informed her husband, who reported it to Mr. Dixon, Stationmaster at Burton Agnes, the next day. Owing to his going away, forgetfulness, and other causes of delay, matters so remained, until it was arranged to repair the damage on the very day of the accident.

Inspecting Officer's Conclusions

This accident was due to a combination of causes: (*a*) the breakage of the lock; (*b*) the delay in repairing it, or devising a substitute fastening; (*c*) Mrs. Dalton's failure to notice the car in time; and (*d*) the failure of its occupants to look out for trains.

No doubt the urgency of repair was discounted in the minds of the staff responsible by the thought that for 80 years there had been no locks on the gates, and traffic at this time was small and local. Some temporary fastening might nevertheless have been improvised; failing this a notice "call gate keeper" would have probably sufficed. Mr. Dixon was mainly responsible for the delay, and admitted his oversight. The extra watch Mrs. Dalton was giving was as much as could reasonably be expected.

Mr. Herbert could not remember having passed over a crossing where the user operated the gates, and no blame is attributable to him for not trying to open the far gate, first, and not noticing the broken lock. Mr. Gee's action is difficult to understand, especially his not pausing to look out, and more still his failure to stop while crossing the down track when the up train was only a few yards away. He was probably moving on low or second gear. The most probable explanation is a momentary distraction, or "blind spot," visual or mental, which sometimes occurs to the most careful persons, and is perhaps a more frequent cause of accident than is realised.

The lock having been repaired there should be no appreciable risk to anyone using the main gates, provided the crossing-keeper strictly obeys the regulations. Such persons are using the crossing under the supervision of the railway staff, who have adequate warning of the trains and are responsible for safety. But there is the larger question of other public road crossings with occupation type gates, in some cases not secured by locks. For many years it has been a requirement in respect of all new works that public road crossing gates should close alternately across road and rail, and, where necessary, be protected by interlocked signals, but a number of the old type are still in existence, and in the North-Eastern Area of the L.N.E.R. some 61 public road crossings on minor roads are not locked in any way; 44 others are padlocked at night only. All have gates opening away from the line.

The Act under which this railway was constructed incorporates the Rail-

* An illustrated description of the methods adopted for handling traffic in connection with the Royal Agricultural Show appeared in THE RAILWAY GAZETTE for September 30, 1932.

ways Clauses Consolidation Act of 1845, Section 47 of which requires the company to provide gates at public road crossings, with proper persons to open and shut them; to be constantly closed across the roadway except when road traffic is crossing, &c. Nowadays, many road vehicle drivers are strangers, some are impatient, some careless. Many persons do not appreciate the difference between a *public road crossing*, where the railway is responsible for safety, and an *occupation crossing* where the road user is; in cases similar to Harpham crossing road conditions may be likely to mislead a stranger motorist into thinking it is an occupation crossing.

In these changed conditions, public road crossings ought not to be left in such a condition that it is possible for a road user ignorant of local conditions to escape the notice of the gate keeper and operate the gates, depriving himself of the benefit of the protective arrangements provided by the company. Failing a bridge, a crossing equipped with gates closing alternately across road and rail, and with interlocked signals if necessary, affords almost complete protection, as is proved by accident records for many years, and is the ideal to be sought at the many crossings where there can be no reasonable expectation of bridging. The company should examine present-day traffic conditions at public road crossings still equipped with gates opening away from the railway, with a view to the provision of modern gate equipment where conditions justify this; at a number it would probably be reasonably sufficient to arrange that when the present gates are due for renewal they should be replaced by up-to-date equipment.

The necessity for interlocked signals depends on a number of factors such as traffic, view of gates, speed of trains, gradients, &c., and would be for decision on the merits of each case. The old-fashioned gate board in this area is a poor substitute for signals of normal type, and without interlocking there can be no certainty that it is always turned to danger before the gates are opened.

Pending the execution of a policy of gradual modernisation, steps should be taken without delay to provide and maintain locks on all public road crossings with occupation type gates, to ensure that a road user can cross only under the supervision of the staff, who should be provided with adequate indication of the approach of trains. At the majority of such crossings it would not be necessary to lock the wicket gates as well as the main gates, but the provision of "Stop, Look, and Listen," or similar warning notices, may be desirable.

The Southward Trend of British Industry

Representatives of the London & North Eastern Railway Debating Societies in the Northern Area visited Paddington station on February 4 and engaged in a joint debate with the Great Western Railway Lecture and Debating Society. Mr. A. S. Quartermaine (Assistant Chief Engineer, G.W.R.) presided, and the respective speakers were Mr. D. Murray (Goods Agent, Hull), Mr. G. H. Bowes (Rates Assistant, Goods Manager's office, York), and Mr. A. H. Earley (District Locomotive Superintendent's office, Gateshead), for the L.N.E.R. Debating Societies; and Mr. H. S. Veltom (Goods Agent, Park Royal), Mr. T. H. Hollingsworth (Chief Goods Manager's office), and Mr. E. N. Godfrey (office of the Superintendent of the Line) for the Great Western Railway Society. In the unavoidable absence of Mr. Hollingsworth, his contribution to the debate was read by Mr. R. F. Thurtle.

The proposition, which was moved on behalf of the L.N.E.R. societies, affirmed "That the southward trend of British industry is to be deplored." A good deal of argument was centred upon whether "the southward trend of British industry" meant the removal from north to south of specific individual industries, and it was argued by Great Western representatives that, if this were so, there were very few examples of it and therefore nothing to deplore.

The main issue of the debate, however, was the development of factories, small and large, in the Greater London area. This industrial concentration on London, although mainly of light industries with "luxury" products, had resulted in a substantially increased population in and around the metropolis, while many other parts of the country, and notably towns in the North-East of England, had suffered a drifting away of many of their people of working age. This fact was deplored by the L.N.E.R. speakers, who made the point that there were surplus factories, houses, churches, &c., in centres in the North, whereas in the new trading estates of Greater London fresh accommodation and amenities had to be built up. The difficulty of defending teeming and overcrowded London in the event of war was also emphasised. Points made by Great Western speakers were that London was chosen by manufacturers of light and miscellaneous articles because the manufacturing site was close to their best markets and served by a great port. Much benefit had been brought to the heavy industries of the North of England by the purchase of materials for the building of the factories, also to the railway companies by their conveyance.

The point was made by Mr. Hollingsworth that although London had grown and spread outwards in all directions, it would be wrong to suppose that the employment of its inhabitants was mainly centred on actual production. The largest body of London workers was in domestic service, 418,000; next came transport workers, 316,000; food and catering, 272,000; dressmaking, tailoring, &c., 264,000; office workers, 227,000; and then, well below all these, came the first of the trades, building, with 165,000 workers.

It was inevitable that in a debate on the southward trend of British industry the parlous condition of South Wales should be referred to. One ingenious L.N.E.R. speaker suggested that, for the purpose of the debate, the true line of division between North and South should be drawn from the Humber and the Severn!

Apart from the platform speeches there were several excellent contributions from the hall. Following an admirably impartial summing up by the Chairman, a vote was taken which showed the motion to be lost by a very narrow majority.

Exports of Railway Material from the United Kingdom in January

	Jan. 1937	Jan. 1936
	£	£
Locomotives, rail	129,984	98,588
Carriages and wagons	190,055	147,038
Rails, steel	144,813	38,881
Wheels, sleepers, fishplates and miscellaneous materials	84,039	36,662

Locomotive and rail exports included in the following :—

	Locomotives		Rails	
	Jan. 1937	Jan. 1936	Jan. 1937	Jan. 1936
	£	£	£	£
Argentina	9,522	—	3,184	7,477
Union of South Africa	—*	—*	82,308	11,864
British India	21,656	2,320	5,901	12,606

* Figures not available.

The Granton-Burntisland Ferry

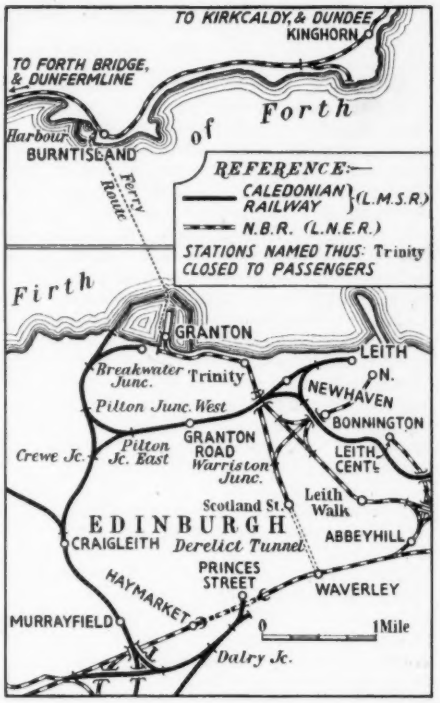
Attention has recently been directed to the ancient railway ferry service across the Firth of Forth between Granton and Burntisland, first by our editorial note entitled "The Matriarch of Train Ferries" (in THE RAILWAY GAZETTE of December 25 last) and the subsequent correspondence, and now by the official announcement of the L.N.E.R. that the *William Muir*, the ferry steamer which has plied on this service for more than half a century, is to be taken out of commission before the end of the month and replaced by *The Snowdrop*, which will now be known as *The Thane of Fife*.

A brief account of the history of this ferry service was published in THE RAILWAY GAZETTE of April 25, 1919, and the passing of the *William Muir* makes appropriate now a recapitulation of the main features. The ferry was established on September 15, 1844, by the Duke of Buccleuch and Sir John Gladstone (father of the great Parliamentarian William Ewart Gladstone), under the Burntisland and Granton Pier and Ferry and Road Act of 1842. Under this Act the proprietors were required to maintain a sufficient ferry service for passengers and goods by providing at least three steamboats crossing eight times each way daily between April and October and six times between October and April "unless prevented by tempestuous weather or unavoidable cause." The authority was for a term of twenty-five years.

Under the Edinburgh and Northern Railway (Burntisland Pier and Ferry) Act, 1847, the rights and obligations of the 1842 Act were vested in the Edinburgh and Northern Railway Company, and from that time the Granton-Burntisland Ferry has been railway owned. It passed to the North British Railway in 1862, when that company absorbed the Edinburgh, Perth & Dundee Railway (itself an amalgamation of the Edinburgh & Northern and the Edinburgh, Leith & Granton), and the operation of the ferry thus ultimately devolved upon the London & North Eastern Railway, which is, therefore, bound by Act of Parliament to continue it.

For many years a train ferry service was given—the first in the world, we believe—for which purpose three boats were fitted with rails and were each capable of carrying 30 or 40 goods trucks. The original train ferry was the *Leviathan*, a vessel built and engined by Robert Napier & Sons, which began the service in 1849 and continued at work until the opening of the Forth bridge on March 4, 1890, made the goods train ferry redundant. She was sold out of service and condemned for breaking up in 1892. Passenger carriages were not run on the ferry, but separate boats accommodated passengers, who changed from train to steamer.

The most recent passenger boats on the Granton-Burntisland ferry were the *John Stirling* and *William Muir*, named after a Chairman and Senior Director of the North British Railway. Each provided accommodation for 950 passengers besides carriages, horses, and so forth. The opening of the Forth Bridge 47 years ago resulted in the passing away of all the vessels on the service with the exception of the *William Muir*. She was built at Kinghorn by John Kay & Sons in 1879, and was put on the Granton & Burntisland ferry service in the same year. When she was re-engined and re-boilered in 1910 by Ramage & Ferguson Limited of Leith, her original two funnels were replaced by a single funnel of larger size. In the great war the *William Muir* was chartered by the Admiralty from June, 1917, to May, 1919, as a mine sweeper with Sheerness as her base. It was in view of war needs that the first real break since its inauguration occurred in the maintenance of the ferry service, for to meet Admiralty requirements sailings were temporarily suspended from December 30, 1916, until the middle of 1919.



The Granton–Burntisland ferry in relation to the railways north and south of the Firth of Forth

It is estimated that when the *William Muir* makes her last trip she will have completed approximately 80,000 crossings each way, totalling 800,000 miles which is equal to about 32 times around the world. One of the heaviest traffics with which this famous vessel was associated was the transport from Granton to Burntisland one night in 1889 of Lord George Sanger's circus and menagerie, when, in company with her sister ship the *John Stirling*, some 500 horses, camels, dromedaries, elephants, &c., and 50 caravans were shipped over. Embarkation began at 10 p.m. and by 4 o'clock the following morning the whole of this vast consignment was safely landed on the other side. Some difficulty was experienced in the loading of the large caravans and the services of *Jumbo*, the largest elephant, were enlisted in more than one instance to move these vehicles across the pier.

The Snowdrop, the vessel which is now to take up the ferry service, was until recently employed in passenger carrying ferry service on the Mersey between Liverpool and New Brighton. She is a twin-screw steamer, 152 ft. in length, and was built in 1910 by Cammell Laird & Co. Ltd., Birkenhead. On being taken over by the L.N.E.R. from the County Borough of Wallasey Corporation Ferries, this vessel experienced a rather exciting passage in exceptionally stormy weather on her way round the North of Scotland to Bo'ness in tow of the tugboat *Warrior*. At one part of the journey near Cape Wrath she became detached from the tugboat and was adrift without anybody on board and without lights for two days until resighted by the tugboat and again taken in tow. When she takes up her duties in the Granton and Burnisland ferry service she will be required to carry a certain amount of vehicular traffic as well as passengers, and a contract to carry out the alterations necessary to adapt her for that purpose, besides some strengthening of the vessel to withstand the more exposed conditions with which she will be faced in the Forth and a certain amount of repainting, has been placed by the L.N.E.R. with the Grangemouth Dockyard Company.

REPORT ON WELDING SYMPOSIUM.—The report by the Welding Committee of the Iron and Steel Institute on the Symposium on the Welding of Iron and Steel held in London on May 2 and 3, 1935, has now been issued, and is reproduced in the February issue of *The Welding Industry*. The report was approved by the Council of the Iron and Steel Institute on September 21, 1936, and has been endorsed to date by the councils of thirteen of the fifteen societies and technical institutions to which it has been submitted. These endorsements authorise the Institute of Welding to proceed with a national scheme of co-ordinated research on behalf of the engineering industries, alluded to in our issue of January 11, 1935.

The Bouts-Tillotson Appeal

(See editorial note on page 305)

On Monday of this week the Appeal Tribunal set up under the Road and Rail Traffic Act, 1933, dismissed the appeals of the four main-line railway companies against the award by the Metropolitan Licensing Authority to Bouts-Tillotson Transport Limited, of "A" licences for 128 vehicles and 42 trailers on trunk routes to and from London. The application for licences had been opposed by the railway companies mainly on the ground that suitable rail transport facilities were already in excess of requirements. The tribunal before which the appeal was heard was composed of Mr. Rowand Harker, K.C. (Chairman), Mr. E. S. Shrapnell-Smith, and Mr. F. C. Fairholme.

Delivering judgment, Mr. Rowand Harker said that Bouts-Tillotson Transport Limited had originally applied to Mr. Gleeson Robinson, the Metropolitan Licensing Authority, to be authorised to use 139 motor vehicles and 56 trailers. A public enquiry had been held and, during the course of the proceedings, the respondent had intimated that, as a number of trailers which it was authorised to use were never all in use on the same day, it desired to be authorised to use only 36 trailers of 3¼ tons and six trailers of 3½ tons. Mr. Gleeson Robinson's decision had been to grant the application in respect of 128 motor vehicles of an aggregate tonnage of 650 tons and of 42 trailers aggregating 138 tons.

Mr. Harker continued that the appeals by the main-line railways against that grant of licences had been presented as test cases. So far as the Appeal Tribunal was able to judge, the question which the appellants sought to test was whether or not it was in the public interest that all, or substantially all, road transport services on trunk routes in England, Scotland and Wales, should be eliminated, thereby giving the railways a monopoly, except in exceptional circumstances, of all traffic on those routes. "It is no part of our function to decide such a question," said Mr. Harker. "Our function is to decide these appeals in accordance with the intentions of the legislature and in accordance with the evidence which was given at the public enquiry paying due regard to the statement of the licensing authority and to the arguments which were adduced before us."

Mr. Ashton Davies, in his evidence on behalf of the railway companies, had dealt with a number of matters which could not properly be taken into consideration by the Appeal Tribunal. One related to the rates which railway companies were permitted to charge and the lower rates road hauliers were stated to be able to charge. It had been suggested that the railway rates structure would thus be imperilled. Mr. Gleeson Robinson had said he had no jurisdiction in regard to rates of charges for road transport. The Appeal Tribunal agreed with that statement. If there were good foundation for the suggestion of the railway companies that goods could be and were carried by road at rates economic to the haulier and lower than the rates at which the railways could carry the same goods, the railway companies must seek their remedy elsewhere.

Further, the tribunal could find nothing in the Road and Rail Traffic Act, 1933, even to suggest that the licensing authority could make a classification of goods which should in normal circumstances be carried by rail or road respectively. The tribunal was satisfied that, with the exception of 11 vehicles respecting which the original application had been refused by Mr. Gleeson Robinson, the vehicles of Bouts-Tillotson Transport Limited had been fully employed, and that so far as certain traders were concerned rail transport was not suitable for all their goods. The evidence of Mr. Ashton Davies had satisfied the tribunal that the facilities which were and could be provided by the railway companies were physically adequate to carry all the traffic carried by the respondents. The tribunal was also satisfied that the respondent was now carrying a substantial amount of traffic formerly carried by one or other of the appellants.

The railway companies had also proved that they carried large quantities of goods of the same class as those carried by the respondent, and that in the past they had carried those goods for the same persons and between the same places as they were now being carried by the respondent. The appellants had further proved that they had varying amounts of unused carrying capacity. It was, however, impossible for the tribunal to decide what influenced any trader to send goods by road, and it was equally impossible for it to say that the facilities provided by the railways were suitable for carrying the goods which were being carried by the respondent. The tribunal was of opinion that the appellants did not prove that the transport facilities provided by them in the district or between the places intended to be served by the respondent were suitable transport facilities, and that consequently no over-riding circumstance was proved which would make it in the public interest that the respondent's application should be refused.

QUESTIONS IN PARLIAMENT

Railway Disputes

Mr. Ernest Brown (Minister of Labour) on February 11 informed Mr. G. Ridley (Clay Cross—Lab.) that the aggregate number of working days lost in 1936 in industrial disputes involving stoppage of work was approximately 6,000 in the railway industry.

Lincoln Level Crossings

Mr. W. S. Liddall (Lincoln—C.), on February 15, asked the Minister of Transport what progress had been made in regard to the abolition of the three level-crossings situate near the centre of the city of Lincoln; what representations had been made to him by the corporation or other public bodies; and whether he recognised the urgency of the question to the trade and commerce of the city and the risks and dangers daily encountered thereby by pedestrians and vehicular traffic.

Captain Austin Hudson (Parliamentary Secretary to the Ministry of Transport): Recently the Corporation propounded a scheme for the provision of an alternative route. This is now under revision, and when definite proposals are submitted they will receive immediate attention.

Risk from Red Hot Cinders

Mr. Robert Gibson (Greenock—Lab.), on February 17 asked the Minister of Transport, if he was aware of the risk of red-hot cinders from locomotives causing damage to persons or property in towns and cities in the case of heavy main-line trains; and whether, to eliminate this risk, he would introduce legislation requiring main railway lines to be electrified at, and for, say, two miles from termini and intermediate stations, and the heavy trains with steam locomotives in front set in motion by separate electrical locomotives pushing the trains over the electrified portions, and thereafter the steam locomotive taking up the load without the aforesaid risk.

Mr. Hore-Belisha (Minister of Transport): No evidence of appreciable risk is before me.

Compensation for Disturbance

Mr. R. Sorensen (Leyton, W.—Lab.), on February 17 asked the Minister of Transport, whether householders adjacent to the proposed new electric railway track running through Leyton would be paid compensation for disturbance and loss of amenities during and after construction.

Mr. Hore-Belisha (Minister of Transport): The board's Act of 1936, which authorises the railway extension to which the hon. member refers, contains provisions of the Lands Clauses Acts as modified by the Acquisition of Lands (Assessment of Compensation) Act, 1919. Moreover, the Act provides for the payment of compensation in respect of houses or buildings injuriously affected by the working of the underground railways. The question whether compensation is payable in any particular case is a matter for determination by the Official Arbitrator appointed under the Act of 1919.

STAFF AND LABOUR MATTERS

Road Transport Wages—Bus Employees

The first conference of the newly formed Bus Federation was held in Leeds on Wednesday and Thursday, February 10 and 11. The federation, which comprises representatives of the Transport and General Workers' Union, and the National Union of Railwaymen, has been brought into being with the object of obtaining the establishment of National Machinery of Negotiation for dealing with rates of pay and conditions of employment of omnibus employees. The Secretary of the Federation is Mr. Harold Clay (of the Transport and General Workers' Union, and Mr. John Marchbank (the General Secretary of the National Union of Railwaymen) presided over the conference. After the session on February 11, it was stated that the following resolutions had been passed:—

(1) This conference requests the Bus Federation to take the necessary steps with a view to setting up national machinery on an industrial council basis for the purpose of discussing national and local matters affecting the staffs concerned.

(2) That steps be taken to establish national agreements covering wages and conditions of service of the various staffs concerned.

(3) The conference instructs the federation to ensure that the first consideration under national agreements will be the establishment of a national minimum wage for each grade employed in the industry.

(4) The conference strongly deprecates the lengthy period in some existing agreements in proceeding from minimum to maximum rates.

(5) The conference takes strong exception to the employment of casual labour in the industry and urges that every effort be made to eliminate the employment of this type of labour.

It was explained that the second resolution, dealing with the establishment of national agreements, was intended to cover garage staffs as well as drivers and conductors. The federation took the view that all employees should be subject to the conditions of the guaranteed week. It also believed in the principle of "'equal pay for equal work,' whether performed by a man or a woman."

It is understood that after reports of the conference have been considered by the executive committees of the two trade unions, an approach will be made to responsible organisations on the employers' side. As is well known, the four main-line railway companies have substantial holdings in a number of passenger road transport undertakings. Particulars of holdings and earnings were given in our issues of March 13, 1936 (page 513) and August 28 (page 339).

During the progress of the Bus Federation conference, the Lord Mayor of Leeds (Mr. Tom Coombs) welcomed the delegates, and, having referred to the "considerable interest" taken by the railway companies in the development of bus services, expressed the hope "that the railway companies will look upon them not in the same light that they looked upon railways in the Victorian era, but in a much more enlightened sense."

Mr. Coombs said he had seen great developments in railways, but there had always been a conservatism about them which made them more or less arrogant, and not so desirous of giving service to the public, in the proper sense of the word—certainly not in the sense that bus operators had done. "I hope," he continued, "that the enterprise of bus operators, who have opened up country districts as the railway companies were never in a position to do, will not be held back by the railway companies, but that the railway companies will get the spirit of progress and co-operation in developing these services." Mr. Coombs advised the railway companies not always to consider the position in the same sense that they did when they had passenger traffic to themselves.

Mr. Marchbank, speaking at a public meeting following the first day's session, said: "the trade unions were not asking for anything of a revolutionary nature. They asked only for some means whereby the workers in the road transport industry would be dealt with in a more general way in respect of wage rates and conditions of work than was possible at the present time. It was hoped that national and local machinery for that purpose would be formed."

Mr. Marchbank said there was a time when there were 1,076 railway companies in Great Britain. They were reduced in numbers until after the war it was possible to form national conditions of employment for railway workers. "Just as the Government found it necessary during the war to introduce central control for rail transport in the interests of the nation," he added, "so we say that the time is long since past when all forms of transport by road, rail, sea, and air should be nationally organised in the interests of the whole community."

Railway General Managers meet A.S.L.E.F.

During the past fortnight some interest has been aroused as to the position created by the decision of the special delegate conference of the Associated Society of Locomotive Engineers and Firemen to reject the findings (No. 2), dated December 29, of the Railway Staff National Tribunal on the claims submitted by the society. It will be remembered that, on Tuesday, January 26, the executive committee of the union met representatives of the railway companies when, as recorded in our issue of January 29, it was officially stated that "the meeting was adjourned."

Comments on the position have been made in various quarters, but nothing definite emerged until Friday, February 12, when it was announced that the general managers would meet the society's executive committee on Monday, February 15. This meeting took place as announced, and Mr. W. V. Wood (a Vice-President of the L.M.S.R. and Chairman of the General Managers' Conference) occupied the chair. Afterwards an official *communiqué* was issued, which simply stated that: "after full discussion, it was agreed that the meeting should stand adjourned until the second week in March, when the companies' accounts for the year 1936 will be available."

L.M.S.R. London District Goods Manager's Smoking Concert

Mr. A. L. Castleman, London District Goods Manager, L.M.S.R., presided at the London District Goods Manager's smoking concert, which was held at the Queen's Hall, London, on Monday, February 15. He was supported by:—

Mr. Galloway (Assistant District Goods Manager); Mr. W. O. Davies (Commercial Assistant); Mr. Overend (Operating Assistant); Mr. Hewitt (Cartage Assistant); Mr. Ayrton (Staff Assistant).

Officers of the company present included: Sir Harold Hartley, Messrs. Ashton Davies, A. F. Bound, J. Shearman, E. Taylor, T. W. Royle, and F. A. Pope.

Others present included: Messrs. H. J. Hoskins (Great Western Railway); A. Gregory, F. C. C. Stanley, P. Syder and F. Warriner (L. & N.E. Railway); E. E. Young (Southern Railway); E. E. Painter (Railway Clearing House); F. Tipton and J. R. Smith (Thames Steam Tug & Lighterage Company); F. Edmeades (Union Lighterage Company); and representatives of most of the important trading concerns in London.

An excellent programme was provided. The artists included: Janet Hamilton-Smith, Janet Howe, Raymond Newell, Sid Plummer, Murray Ashford and Edgar Sawyer, Doris Palmer, Marriott Edgar, Charles Harrison, Emile Philippe, and Percy Tapp.

The Chairman continued the practice started in 1930, when he decided that speeches were not desirable at concerts and instead printed the following message on the programme:

"Three years ago we were all becoming more cheerful as a result of the lifting of the clouds of depression and the improvement in trade.

"There would seem to be some foundation for hoping that this improvement will continue, and I should like to thank those leaders of commerce and travellers who are present tonight, and their friends, for giving the London Midland & Scottish Railway the opportunity of sharing in the increased prosperity of the country.

"I welcome you to our concert once again, and hope you will always appreciate that the L.M.S. Railway is the "Best Way" to travel and by which to send goods or parcels.

"Our aim is to do your transport work for you—and do it well. If you have problems, place the facts before us and we will solve them for you."

NOTES AND NEWS

Grand Trunk Junior Stocks Limited.—The address of this company is now 34, Millbank, Westminster, London, S.W.1.

Loud Speakers at Snow Hill, Birmingham.—The experimental installation of loud speakers for directing traffic at Snow Hill station, G.W.R., has proved so satisfactory that it is now to be made a permanent feature of the station equipment.

G.W.R. Partitioned Wagons for Fragile Freights.—Fifty goods wagons designed to reduce to a minimum the damage to which eggs, soft fruit, furniture, and other fragile freights are susceptible in transit, are to be built by the G.W.R. The interior of these wagons will be fitted with a series of adjustable partitions.

New G.W.R. Buckinghamshire Halt.—A new halt is to be provided by the G.W.R. at Dorton between Brill & Ludgershall and Haddenham stations to serve an agricultural district with a population of 650 living in the villages of Dorton, Wotton, Chilton, and Ashendon. The halt will have two platforms with shelters, and will be lit by electricity.

Extension of Seat Reservation Facilities.—In order to assist the reservation of seats in long-distance trains, the British railways are arranging to supply ticket agents in the London district with standard forms for the transmission of rail seat reservation orders. This arrangement will operate from March 1 and will reduce the risk of errors in orders for reserved seats, avoid the double booking of seats, and ensure "facing engine" or "back to engine" accommodation as chosen being obtained.

Cheshire Lines Management Changes.—For some time past, some of the staff of the Cheshire Lines Committee have been transferred to the service of the L.M.S.R., and last week others were discharged from the service of the C.L.C. as from February 13 and re-engaged by the L.M.S.R. We learn officially that no alteration is being made in the control of the traffic staff, which remains under the Manager of the C.L.C. The L.M.S.R. has, however, taken over the accountancy, engineering, estates, and rating of the C.L.C., with responsibility for the appropriate staffs.

Patent No. 213,524.—We understand that the patent litigation between the Tool Metal Manufacturing Co. Ltd., the manufacturer of Wimet hard metal alloys, and the British Thomson-Houston Co. Ltd., the manufacturer of Ardoloy, has now been settled. It was claimed by the Tool Metal Manufacturing Co. Ltd. that Ardoloy constituted an infringement of Patent No. 213,524 which covers tools made of a sintered mixture of carbide and certain auxiliary metals. The British Thomson-Houston Company has now agreed to recognise the validity of the patent and the claims made by T.M.M.C.; to accept a licence under the patent; and to make certain payments to the patentees.

Railway Bills in Parliament.—A Select Committee of the House of Commons presided over by Sir John Ganzoni, will on Tuesday, March 2, begin the consideration of Group B of Private Bills, which includes those of the Great Western, London Midland & Scottish, London & North Eastern, and Southern Railway Companies. None of these railway Bills will, however, be considered on the first day of meeting.

New Yorkshire Station.—The L.N.E.R. intends to build a halt at Kinsley Road bridge between Hemsworth and Nostell stations on the Doncaster-Wakefield line. The halt will consist of an island platform 350 ft. long, with a booking office and waiting room. This halt will serve the mining villages of Fitzwilliam, Kinsley, Brackenhill, Ackworth, and Havercroft, which are all within a radius of about 1¼ miles from Kinsley Road.

Reconstruction of the Argentine Transandine Railway.—In connection with the decision of the Argentine Government to take over control of the Argentine Transandine Railway on grounds of public necessity—as recorded in the news section of our issue of February 5—General Justo, President of the Republic, signed a Decree on February 12, authorising the reconstruction of the section of line between Mendoza and Punta de Vacas, that was so seriously damaged by landslides and floods in January, 1934. The estimated cost of this work is said to be about $5,600,000 paper. This decision will give great satisfaction both in Argentina and in Chile and will give a great fillip to trade between those countries.

Opening of Sierpc-Torun Line, Poland.—The opening of the new railway line from Sierpc to Torun took place on January 23, in the presence of the Minister and Vice-Minister of Communications and a number of high Government officials. The length of the line is 78·8 km., and the cost of construction, amounting to about 11½ mill. zloty, was covered entirely by the State Treasury. The new line is an extension of the railway line Nasielsk-Sierpc, opened for traffic in 1934, and forms, together with the latter, an important communication on the right bank of the Vistula. The new line runs through a fertile area of Poland (Mazowsze) and creates great possibilities for its future development by linking it up with Pomerania. Moreover, the newly-opened railway line will, together with the railway line from Zegrze to Tluszcz opened (as recorded in THE RAILWAY GAZETTE of September 4 last, page 384) for traffic in 1936, shorten the connection between the Eastern parts of Poland and the Polish sea ports.

L.N.E.R. Express Derailed Near Sleaford.—The 10.45 a.m. York-Lowestoft express of the L.N.E.R. was derailed last Monday (February 15) at a junction about a mile north of Sleaford. The derailed vehicles demolished a platelayers' hut in which five men were having a meal. Four of the platelayers were killed, and one injured. Minor injuries were also sustained by five passengers. The inquest on the men who were killed was opened at Sleaford on Tuesday, but was adjourned for a week.

German Railways Taken Over by the Government.—In accordance with Herr Hitler's speech to the Reichstag on January 30, the whole of the railways formerly owned by the German State Railway Company reverted of the Reich on February 12. Dr. Dorpmüller, as already announced in our Personal columns, has been appointed Minister of Transport and as such has taken over *inter alia* the duties of General Manager of the railways; a state secretary and other ministerial officials have replaced the former managing board. All ordinary shares in the company were acquired by the Government prior to the publication of the law announcing the change, states a Reuters message from Berlin.

The Salzkammergut Railway Closed.—On Wednesday, February 10, this small Austrian railway, which runs between Salzburg and Bad Ischl, suspended its services. A press report from Vienna states that the undertaking is heavily in debt and unable further to pay its way. The staff affected consists of 142 employees and 14 pensioners. The line runs through the most picturesque part of the Salzkammergut, one of the loveliest regions of lake, river, and mountain scenery in Europe. It serves many well-known tourist villages including St. Wolfgang, and the famous White Horse Inn. It is expected that some means will be found to re-open the railway when the tourist season begins.

Czecho-German Frontier Railway Agreement.—After several years' negotiation, agreement has at last been finally and satisfactorily reached between the German and Czechoslovak Governments concerning certain railways and stations on the frontier between the two countries. The 18-mile section of line connecting Liberec in Bohemia with Zittau in Germany (about 50 miles east of Dresden), and also Cheb station, are to be handed over by the Germans to the Czechoslovak State Railways. On the other hand the line running from the frontier to Cheb, in Czechoslovak territory, is to be run by the German State Railway, while the line from Adorf to the frontier—part of the Plauen-Cheb section—in Saxony, is to continue to be worked by Czechoslovak agency.

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 6th Week			Totals to Date		
	1937	1936	Inc. or Dec.	1937	1936	Inc. or Dec.
L.M.S.R. (6,880¼ mls.)	£	£	£	£	£	£
Passenger-train traffic...	383,000	363,000	+ 17,000	2,201,000	2,166,000	+ 35,000
Merchandise, &c. ...	473,000	461,000	+ 12,000	2,810,000	2,722,000	+ 88,000
Coal and coke ...	294,000	278,000	+ 16,000	1,724,000	1,771,000	− 47,000
Goods-train traffic ...	767,000	739,000	+ 28,000	4,534,000	4,493,000	+ 41,000
Total receipts	1,147,000	1,102,000	+ 45,000	6,735,000	6,659,000	+ 76,000
L.N.E.R. (6,332 mls.)						
Passenger-train traffic...	254,000	244,000	+ 10,000	1,483,000	1,456,000	+ 27,000
Merchandise, &c. ...	320,000	320,000	—	1,902,000	1,896,000	+ 6,000
Coal and coke ...	275,000	263,000	+ 12,000	1,571,000	1,642,000	− 71,000
Goods-train traffic ...	595,000	583,000	+ 12,000	3,473,000	3,538,000	− 65,000
Total receipts ...	849,000	827,000	+ 22,000	4,956,000	4,994,000	− 38,000
G.W.R. (3,738½ mls.)						
Passenger-train traffic...	154,000	146,000	+ 8,000	930,000	924,000	+ 6,000
Merchandise, &c. ...	192,000	182,000	+ 10,000	1,116,000	1,083,000	+ 33,000
Coal and coke ...	120,000	108,000	+ 12,000	704,000	709,000	− 5,000
Goods-train traffic ...	312,000	290,000	+ 22,000	1,820,000	1,792,000	+ 28,000
Total receipts	466,000	436,000	+ 30,000	2,750,000	2,716,000	+ 34,000
S.R. (2,153 mls.)						
Passenger-train traffic...	248,000	227,000	+ 21,000	1,486,000	1,427,000	+ 59,000
Merchandise, &c. ...	57,000	58,500	− 1,500	328,000	343,000	− 15,000
Coal and coke ...	36,000	37,500	− 1,500	206,000	238,000	− 32,000
Goods-train traffic ...	93,000	96,000	− 3,000	534,000	581,000	− 47,000
Total receipts	341,000	323,000	+ 18,000	2,020,000	2,008,000	+ 12,000
Liverpool Overhead ... (6½ mls.)	1,148	1,052	+ 96	7,109	6,939	+ 170
Mersey (4½ mls.) ...	3,971	3,866	+ 105	25,593	24,813	+ 780
*London Passenger Transport Board ...	548,400	515,800	+ 32,600	18,441,000	17,917,200	+ 523,800
IRELAND						
†Belfast & C.D. pass. (80 mls.)	1,661	1,711	− 50	10,268	11,285	− 1,017
,, ,, goods	365	553	− 188	2,733	3,299	− 566
,, ,, total	2,026	2,264	− 238	13,001	14,584	− 1,583
Great Northern pass. (543 mls.)	7,450	7,600	− 150	44,800	46,600	− 1,800
,, ,, goods	8,400	10,200	− 1,800	52,900	58,350	− 5,450
,, ,, total	15,850	17,800	− 1,950	97,700	104,950	− 7,250
Great Southern, pass. (2,075 mls.)	25,750	25,711	+ 39	154,577	158,828	− 4,251
,, ,, goods	38,690	37,569	+ 1,121	250,582	247,530	+ 3,052
,, ,, total	64,440	63,280	+ 1,160	405,159	406,358	− 1,199

* 33rd week † 7th week

Forthcoming Events

Feb. 19 (*Fri.*).—Institute of Transport (London), at Connaught Rooms, Great Queen Street, W.C.2. Annual Dinner.
L.N.E.R. Literary Society, at Queen's Hall, Langham Place, London, W.1, 7.30 p.m. Smoking Concert.
Permanent Way Institution (Hull), at New Lecture Hall, Paragon Station, 7 p.m. "Continental Railways," by Mr. W. A. Willox.
Feb. 22 (*Mon.*).—Institute of Welding (Teesside), at Cleveland Scientific Inst., Corporation Road, Middlesbrough, 7.30 p.m. "Flame Cutting or Other Means as Preparation for Welding," by Mr. C. Bainbridge.
Feb. 23 (*Tues.*).—Institute of Transport (Birmingham Graduate), at Imperial Hotel, 6.30 p.m. Paper on Imperial Airways.
L.N.E.R. (York) Lecture and Debating Society, at Railway Inst., Queen Street, 6.45 p.m. Debate: "That the Imposition of International Tariffs and Quotas has had a Detrimental Effect on British Railway Traffics." Affirmative: Mr. W. Jesper. Negative: Mr. T. Cameron.
Permanent Way Institution (Scottish), at Royal Technical College, George Street, Glasgow, 7.30 p.m. "Mechanical Signalling," by Mr. A. Moss.
Feb. 24 (*Wed.*).—Institution of Locomotive Engineers (London), at Inst. of Mechanical Engineers, Storey's Gate, S.W.1, 6 p.m. "Opto-mechanical Methods of Lining-up Locomotive Frames," by Mr. J. Scott.
Institution of Railway Signal Engineers at Inst. of Electrical Engineers, Savoy Place, London, W.C.2, 6 p.m. Annual General Meeting and Presidential Address.
L.N.E.R. (Darlington) Lecture and Debating Society, at North Road Inst., 7.30 p.m. "The Transit of 'Smalls' Traffic," by the Study Circle.
L.N.E.R. (Newcastle-Sunderland) Lecture and Debating Society, at Sunderland, 7 p.m. "Some Insights to Locomotive Running," by Mr. E. Trask.
Royal Society of Arts, John Street, W.C.2, 8.15 p.m., "Alloys," by Prof. W. Bragg.
Feb. 25 (*Thurs.*).—Institution of Electrical Engineers, Savoy Place, London, W.C.2, 6 p.m. "Applications and Construction of On-Load Tap-Changing Gear on Transformers," by Mr. H. Diggle.
Institution of Structural Engineers (London), at Inst. of Civil Engineers, Great George Street, S.W.1, 6.30 p.m. "Strength Tests for Cement," by Dr. W. Glanville.
Permanent Way Institution (Brighton), at Welfare Room, New England Street, 7 p.m. Discussion: "Rail Adjusting."
Feb. 26 (*Fri.*).—Institute of Transport (Manchester-Liverpool), at Central Library, Manchester, 6.30 p.m. "Legislation Affecting Public Safety in Relation Particularly to Road Passenger Transport," by Mr. J. Woodford.
Railway Students' Association (Edinburgh), at Goold Hall, St. Andrew Square, 7.30 p.m. "The Romance of the Post Office," by Mr. A. Moncrieff.

British and Irish Railways Stocks and Shares

Stocks	Highest 1936	Lowest 1936	Prices Feb. 17. 1937	Prices Rise/Fall
G.W.R.				
Cons. Ord. ...	64¼	45½	59*	−4½
5% Con. Prefce. ...	126½	116¾	117*	−5
5% Red.Pref.(1950)	113	108½	109½*	−2
4% Deb.	119½	110½	107	−2½
4½% Deb.... ...	121	114	111½	−5
4½% Deb.... ...	129	121	114½	−5
5% Deb.	141	134	127½	−3
2½% Deb.... ...	79⅛	74	73	−2½
5% Rt. Charge ...	136½	130	125½	−3½
5% Cons. Guar. ...	135¼	127¾	122½*	−6
L.M.S.R.				
Ord.	35⅝	17	29*	−2½
4% Prefce. (1923)	83	52½	75*	−4
4% Prefce. ...	92¾	81	83½*	−3½
5% Red.Pref.(1955)	109¼	103¼	105	−2
4% Deb.	111¾	105 9/16	101	−1½
5% Red.Deb.(1952)	119⅝	115½	114½	−1
4% Guar. ...	106¾	101⅝	97	−1½
L.N.E.R.				
5% Pref. Ord. ...	14	9	10	−¾
Def. Ord.	7¼	4¾	5¼	−¼
4% First Prefce.	79¼	55¼	73	−2
4% Second Prefce.	31⅞	18¼	23½	−1½
5% Red.Pref.(1935)	100½	77¾	99½	—
4% First Guar. ...	104½	98¾	94½	−2
4% Second Guar.	99	90	89	−3
3% Deb.	85¾	79	75	−3
4% Deb.	109¾	104½	99½	−2½
5% Red.Deb.(1947)	116¼	110½	110½	−1
4½% Sinking Fund Red. Deb.	111½	107½	109	—
SOUTHERN				
Pref. Ord.... ...	98¾	82½	93½*	−4½
Def. Ord.	27⅝	20⅛	22¾*	−1¾
5% Pref.	120¾	118½	113½*	−6½
5% Red.Pref.(1964)	119¾	115¼	112½*	−5
5% Guar. Prefce.	136	129½	123½*	−5½
5% Red.Guar.Pref. (1957)	120	115¾	113½*	−3
4% Deb.	117 3/16	109½	105	−1½
5% Deb.	140	134	127½	−3
4% Red. Deb. 1962–67	116½	110	108	−3
BELFAST & C.D.				
Ord.	9	4½	5	—
FORTH BRIDGE				
4% Deb.	107	105	102½	−2
4% Guar. ...	107 3/16	104	101½	−3
G. NORTHERN (IRELAND)				
Ord.	19½	9¾	10	—
G. SOUTHERN (IRELAND)				
Ord.	63	41	47	−2½
Prefce.	65	46	58	—
Guar.	97¼	81	81	−10
Deb.	99¾	83¼	93	+2
L.P.T.B.				
4½% "A" ...	127¾	121	117	−2½
5% "A"	138¼	133½	127½	−2
4½% "T.F.A." ...	111½	108⅛	106	−1
5% "B"	131¾	123¾	119½	−1
"C"	112½	93	96*	−1
MERSEY				
Ord.	40¾	23	36½*	−1
4% Perp. Deb. ...	103	98	100	—
3% Perp. Deb. ...	78	74⅝	76½	—
3% Perp. Prefce.	68⅞	63¼	65½*	−2

* ex dividend

CONTRACTS AND TENDERS

Large L.P.T.B. Rolling Stock Order

The Gloucester Railway Carriage & Wagon Co. Ltd. has received the largest single order for railway rolling-stock ever placed by the London Passenger Transport Board or its predecessor companies. The order, of a total value exceeding £1,000,000, is for 401 cars of which 25 motor cars and 222 trailer cars are required for the District Line and 106 motor cars and 48 trailer cars for the Metropolitan Line. As already recorded in these columns the L.P.T.B. recently ordered 116 new motor cars for the Hammersmith & City Line, with air-operated doors, Metadyne control, and electro-pneumatic brakes, and to cost nearly £700,000. The cars comprising the latest order will be modifications of the latest Hammersmith & City line type. Perhaps the most important feature of the new stock is that it will mean the introduction of air-worked doors and electro-penumatic brakes on the District and Metropolitan Lines. The doors will be so arranged that they may be worked by push-button control operated by passengers under control of the guard, or by the guard direct, as on present tube trains. The new stock will have no footboards, but the sides of the cars will be skirted. The seating and upholstery will be of improved type and the illumination will be soft but bright. Concurrently with these contracts, the board at its Acton works will carry out improvements to the existing District and Metropolitan stock of post-war construction to make it conform as closely as possible to the new cars. Comment on the order is made in an editorial note on page 306 of this issue.

Guest, Keen & Nettlefolds Limited has received an order from the Central Uruguay Railway for 31,200 fishbolts and bolts and nuts for switches and crossings.

The Government of Mysore has placed orders with Düsseldorfer Eisenhutten for 11 tons of dogspikes and with Société J'Ongra for 7·37 tons of mild steel bearing plates.

The Tata Iron & Steel Co. Ltd. has received an order from the Indian Stores Department for 700 tons of medium manganese 90-lb. F.F. steel rails and 30 tons of fishplates, complete with bolts and nuts, at a total price of Rs. 95,751.

The Bhavnagar State Railway Administration has placed orders, to the inspection of Messrs. Robert White & Partners, with Alex. Findlay & Co. Ltd. for 35 20-ft. deck spans and with the Motherwell Bridge & Engineering Co. Ltd. for 43 40-ft. deck spans of bridgework.

Uddeholms General Agency has received an order from the South Indian Railway Administration for 1,320 solid rolled steel boiler tubes, to the inspection of Messrs. Robert White & Partners.

Forges, Usines, et Fonderies de Haine St. Pierre has received an order from the Egyptian State Railways Administration for 70 four-wheeled perishable vans.

Robert Stephenson & Co. Ltd. has received an order from the South Indian Railway Administration for four broad-gauge 2-6-4 passenger tank locomotives to be supplied to the inspection of Messrs. Robert White & Partners.

Taylor Bros. & Co. Ltd. has received an order from the Cordoba Central Railway for 130 pairs of wheels and axles for bogie covered goods wagons and 191 axles for locomotives, carriages, and wagons.

Hurst, Nelson & Co. Ltd. has received an order from Low Temperature Carbonisation Limited for a large number of 20-ton steel rail tank wagons, required for the conveyance of coal-oil traffic. It is believed that this order is the first of its kind which the company has placed.

Hurst, Nelson & Co. Ltd. has also received an order from the Jodhpur Railway Administration, to the inspection of Messrs. Rendel, Palmer & Tritton, for seven carriage underframes 56 ft. 6 in. and one carriage underframe 40 ft. long, complete with wheels and axles and vacuum brake gear.

Paterson & Dickson Limited has received the contract for the pedestrian subways for the new London Passenger Transport Board tube station at Gants Hill, one of the stations included in the £14,500,000 railway scheme in North-East London. Gants Hill station will lie beneath the cross roads at Gants Hill Cross. There will be three subways leading in from Western Avenue and Woodford Avenue. At street level there will be 10 entrances placed to give easy access from any part of the cross roads.

The Crown Agents for the Colonies have placed orders for a total of eight locomotive boilers, divided as follow :—

R. & W. Hawthorn Leslie & Co. Ltd.—One locomotive boiler for 4-8-0 type locomotive, Sierra Leone Government Railways.

Hunslet Engine Co. Ltd.—Six locomotive boilers for Iraq Government Railways.

Nasmyth Wilson & Co. Ltd.—One locomotive boiler for Iraq Government Railways.

The Bombay, Baroda & Central India Railway Administration has placed the following orders to the inspection of Messrs. Rendel, Palmer & Tritton :—

Edgar Allen & Co. Ltd., Eight crossings built up from higher manganese rolled steel rails.

Bochumer Verein A.G., 116 pairs of carriage and wagon wheels and axles.

George Turton Platt & Co. Ltd., 200 buffers for four-wheeled stock.

Vulcan Foundry Co. Ltd., Locomotive crossheads and steel smokebox and firebox tube plates.

Craven Bros. (Manchester) Ltd., One carriage and wagon wheel lathe.

Dorman, Long & Co. Ltd., 1,600 pairs of fishplates for electric bonding.

Steel, Peech & Tozer Limited has received an order from the Central Argentine Railway for 200 locomotive tyres.

It is reported that Huta Batory has received an order from the Iranian Government for 20,000 tons of rails, required for the Trans-Iranian Railway.

Alfred Herbert (India) Limited has received orders from the Indian Stores Department for one 25-in. high-speed shaping machine, seven 13-in. centre by 12-ft. gap bed, sliding, surfacing, and screw-cutting lathes, one 30-in. rapid production single vertical boring mill, one 25-in. high-speed shaping machine and one induction motor and starter.

Siemens (India) Limited has received an order from the Indian Stores Department for two 1,000 kVA. and one 500 kVA. transformers, at a total price, including erection and test, of Rs. 18,950.

The Standard Vacuum Oil Company has received an order from the Burma Railways for the supply of approximately 22,000 gallons of locomotive cylinder oil.

Guest Keen Baldwins Iron & Steel Co. Ltd. has received an order through the High Commissioner for New Zealand for 8,000 tons of steel rails and a quantity of dogspikes and other details, required for the New Zealand Government Railways. The rail order is worth approximately £64,000 and the combined order approximately £70,000.

British Timken Limited has received an order for Timken taper roller-bearing axleboxes for the 99 railcars for the Buenos Ayres Great Southern and Buenos Ayres Western Railways and the eight new cars for the Argentine North Eastern and Entre Rios Railways. Timken bearings also have been ordered for the reversing and final drive shafts. All the above cars were ordered from the Drewry Car Co. Ltd.

Locomotives and Boilers required for India

Tenders are invited by the Madras & Southern Mahratta Railway, receivable at 25, Buckingham Palace Road, Westminster, S.W.1, by March 9, for the following locomotives and boilers :—

Four broad-gauge XD class 2-8-2 light goods locomotives and tenders.

Eight boilers for metre-gauge GS class 4-8-0 locomotives.

Two boilers for metre-gauge MS class 4-6-0 locomotives.

Two boilers for metre-gauge MHS class 4-6-0 locomotives.

One boiler for broad-gauge XB class 4-6-2 locomotive.

The New Zealand Public Works Department is calling for tenders, to be presented in Wellington, New Zealand, by March 2, for the supply of one 5-ton steam-driven travelling crane. Firms desirous of offering a crane of United Kingdom manufacture can obtain further details from the Department of Overseas Trade.

OFFICIAL NOTICES

London & North Eastern Railway Company

NOTICE IS HEREBY GIVEN that the Fourteenth Ordinary General Meeting of the Proprietors of the London & North Eastern Railway Company will be held in the Wharncliffe Rooms, Hotel Great Central, Marylebone, London, N.W.1, on Friday, the 5th day of March, 1937, at 2 p.m., for the purpose of the general business of the Company, and for the purpose of approving, if thought fit, the sale, by agreement, to the Tyne Improvement Commissioners, of the Company's Tyne Docks undertaking.

NOTICE IS HEREBY FURTHER GIVEN that in accordance with the Standing Orders of Parliament a Special or Extraordinary General Meeting of the Proprietors of the Company will be held at the same place on the same day at 3 p.m. or as soon thereafter as the business of the Ordinary General Meeting is concluded, for the purpose of considering and, if thought fit, of approving the Bill which the Company have introduced into Parliament, intituled :—

"A Bill to empower the London & North Eastern Railway Company to construct a railway and other works and to acquire lands; to make provisions with respect to the Nottingham Canal of the said Company; and for other purposes."

and the Bill, promoted by the Great Western Railway Company, which has been introduced into Parliament, intituled :—

"A Bill for conferring further powers upon the Great Western Railway Company in respect of their own undertaking and upon that Company and the London Midland & Scottish Railway Company in respect of an undertaking in which they are jointly interested and upon the Great Western and Great Central Railways Joint Committee, and for other purposes."

Dated this 17th day of February, 1937.

By Order,
JAMES McLAREN,
Secretary.

Marylebone Station,
London, N.W.1.

London Midland & Scottish Railway Company

NOTICE IS HEREBY GIVEN that a Special General Meeting of the London Midland & Scottish Railway Company will, in compliance with the Standing Orders of Parliament, be held at Euston Station, London, N.W.1, on Tuesday, the 2nd day of March, 1937, at 12 o'clock Noon precisely, for the purpose of considering and, if so determined, of approving the undermentioned Bills and Provisional Order, namely :—

BILL PROMOTED BY THE COMPANY.

DEPOSITED IN PARLIAMENT.

London Midland & Scottish Railway Bill.

A Bill to empower the London Midland & Scottish Railway Company to construct works and to acquire lands; to modify rates, dues and charges at Holyhead Harbour; and for other purposes.

PROVISIONAL ORDER PROMOTED BY THE COMPANY.

DEPOSITED WITH THE SCOTTISH OFFICE.

London Midland & Scottish Railway Provisional Order.

A Provisional Order to extend the time for the completion of certain authorised railways and works by the London Midland & Scottish Railway Company; and for other purposes.

BILL PROMOTED BY OTHER PARTIES.

DEPOSITED IN PARLIAMENT.

Great Western Railway Bill.

A Bill for conferring further powers upon the Great Western Railway Company in respect of their own undertaking and upon that Company and the London Midland & Scottish Railway Company in respect of an undertaking in which they are jointly interested and upon the Great Western and Great Central Railways Joint Committee, and for other purposes.

JOSIAH CHARLES STAMP,
Chairman.
OWEN GLYNNE ROBERTS,
Secretary.

Euston Station,
London, N.W.1.
15th February, 1937.

RAILWAY AND OTHER REPORTS

Bengal Dooars Railway.—The directors have declared an interim dividend of 2¼ per cent. on the ordinary stock, on account of the year ending March 31, 1937, payable, less income tax at 2s. 6d. in the £, on March 24, 1937.

Liverpool Overhead Railway.—Gross receipts from the railway for the year 1936 amounted to £62,723, against £61,538 for 1935, and expenditure was £62,348, compared with £62,223, leaving a profit on working of £375, against a loss of £685 for the previous year. Miscellaneous net receipts improved from £5,683 to £5,756, and the total net income was £1,133 higher, at £6,131. The debit balance brought forward from the previous year was £14,498, and allowing for interest of £6,755 on debenture stock the debit balance now carried forward is £15,122.

Oldham, Ashton-under-Lyne, and Guide Bridge Junction Railway.—Gross receipts for the year 1936 were £21,053, against £19,762 in 1935. Expenditure increased by £1,015 to £26,563. Adding miscellaneous receipts (net) and deducting miscellaneous charges leaves a net revenue deficit of £4,155, against £4,317. Amounts receivable under lease from the L.M.S.R. and L.N.E.R. were £6,055, leaving a balance of £1,900 available for dividend. This enables a dividend of 4¾ per cent. to be paid on the £40,000 share capital held by the public. Total passenger train receipts were £8,589, a net decrease of £337. First-class ordinary and season, workmen's tickets, and parcels brought in slightly more, but third class ordinary and season ticket receipts were £412 down. The goods train receipts of £11,896 showed an increase of £1,575.

Forth Bridge Railway.—For the year 1936 the balance credited to the working company (the London & North Eastern Railway) was £1,983, as compared with £2,019 for 1935, and £2,730 for 1934. Traffic receipts from the L.N.E.R. were £177,000, compared with £175,000 for 1935 and £177,000 for 1934, and the net receipts, after deducting expenditure on maintenance of works, general charges, rates, freight rebates fund—rate relief, insurance, etc., amounted to £130,147 in 1936, compared with £130,080 in 1935 and £131,201 in 1934. Net revenue was £123,916 in 1936, against £123,952 in 1935, and £124,663 in 1934. After providing for interest (£28,933) on the 4 per cent. debenture stock and for a dividend of 4 per cent. (£93,000) on the ordinary stock, there remains a balance of £1,983 as above stated.

Forthcoming Meetings

Feb. 23 (*Tues*).—**Liverpool Overhead Railway Company** (Ordinary General), India Buildings, Water Street, Liverpool, at noon.

Feb. 24 (*Wed.*).—**Great Western Railway Company** (Annual General, followed by Special General [Wharncliffe]) Paddington Station, W.2, at 11.30 a.m.

Feb. 24 (*Wed.*).—**Great Northern Railway Company (Ireland)** (Ordinary Annual General), Gresham Hotel, Dublin, at noon.

Feb. 25 (*Thurs.*).—**Belfast & County Down Railway Company** (Ordinary Annual General), Queen's Quay Terminus, Belfast, at 11.30 a.m.

Feb. 25 (*Thurs.*).—**Southern Railway Company** (Annual General, followed by Special General [Wharncliffe]), Southern House, Cannon Street, E.C., at 11.30 a.m.

Feb. 25 (*Thurs.*).—**Mersey Railway Company** (Ordinary General), Winchester House, E.C.2, at noon.

Feb. 25 (*Thurs.*).—**Manchester Ship Canal Company** (Ordinary General), Milton Hall, 244, Deansgate, Manchester, at 11 a.m.

Feb. 25 (*Thurs.*).—**Dundalk Newry & Greenore Railway Company** (Ordinary General), Euston Station, London, N.W., at 12.30 p.m.

Feb. 26 (*Fri.*).—**London Midland & Scottish Railway Company** (Annual General), Friends House, Euston Road, N.W., at 11.30 a.m.

March 2 (*Tues.*).—**London Midland & Scottish Railway Company** (Wharncliffe, followed by Special General), Euston Station, N.W.1, at noon.

March 5 (*Fri.*).—**London & North Eastern Railway Company** (Ordinary General, followed by Special General), Wharncliffe Rooms, Hotel Great Central, Marylebone, N.W.1, at 2 p.m.

March 5 (*Fri.*).—**Great Southern Railways Company** (Ordinary General), Gresham Hotel, Dublin, at 2 p.m.

Railway Share Market

Despite the satisfactory impression created by the annual reports and the encouraging traffic figures for the past week, home railway stocks have shown a reactionary trend. There is a general disposition to await the statements at the annual meetings, and market conditions at the present time are largely influenced by the weakness of British Government securities which has become more pronounced as a result of the increased taxation and large new borrowing powers sought by the Government in connection with the re-armament programme.

L.M.S.R. ordinary has been lowered to 29, but there was a firmer tendency in the stock on Wednesday when it became known that the railway's traffics increased by £45,000 in the past week. The 4 per cent. preference has reacted to 83 and the 1923 preference to 74¾ despite the attractive yields offered. There was rather more attention given to L.N.E.R. second preference at its reduced level of 23½, it being pointed out that if, as is hoped, the impending preliminary figures show a satisfactory improvement in net revenue, the price of this stock might respond. The increase of £22,000 in the railway's traffics for the past week was in excess of expectations. Southern deferred was subsequently steadier at 22¾ on market hopes that favourable statements as to prospects may be made at the meeting. It is being suggested that the Southern's receipts may show good expansion during the Coronation period. The preferred stock has now declined to 93 and the yield seems unduly generous. Great Western were relatively steady at 59, aided by the past week's traffic increase of £30,000. Prior charge stocks generally have moved against holders owing to the trend in British Government securities, but there was a firmer tendency later. London Transport "C" was reactionary.

Argentine railway stocks were active, but price movements were somewhat irregular. Central Argentine issues were in demand on the favourable traffic figures and the 6 per cent. preference went over par this week. The ordinary was in good demand on any decline. B.A. Great Southern ordinary came in for profit-taking. The 6 per cent. preference was good at 81, but the 5 per cent. preference did not keep best prices. B.A. Western 5 per cent. preference was in request. Elsewhere, San Paulo rose strongly to 93 on the favourable dividend estimates current in the market and Leopoldina issues were firmer, but lower prices were made by Antofagasta and Nitrate Rails. Canadian Pacific ordinary and preference were better in response to the stronger tone of New York markets.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

	Railways	Miles open 1936-37	Week Ending	Traffics for Week: Total this year	Traffics for Week: Inc. or Dec. compared with 1936	No. of Weeks	Aggregate Traffics to Date: Totals: This Year	Aggregate Traffics to Date: Totals: Last Year	Aggregate Traffics to Date: Increase or Decrease	Shares or Stock	Prices: Highest 1936	Prices: Lowest 1936	Prices: Feb. 17, 1937	Prices: Yield % (See Note)
				£	£		£	£	£					
South & Central America.	Antofagasta (Chili) & Bolivia	834	14.2.37	15,430	+ 1,840	7	96,580	99,800	– 3,220	Ord. Stk.	25	15¼	25½	Nil
	Argentine North Eastern	753	13.2.37	6,681	– 383	33	293,299	258,265	+ 35,034	,,	12	2	15½	Nil
	Argentine Transandine	—	—	—	—	—	—	—	—	A. Deb.	54	45	90	47/16
	Bolivar	174	Jan., 1937	5,400	– 100	5	5,400	5,500	– 100	6 p.c. Deb.	9	5	7½	Nil
	Brazil	—	—	—	—	—	—	—	—	Bonds.	16	11½	16½	3
	Buenos Ayres & Pacific	2,806	13.2.37	120,781	+ 19,254	33	2,789,496	2,592,993	+ 196,503	Ord. Stk.	17½	6	16	Nil
	Buenos Ayres Central	190	30.1.37	$165,100	+ $63,400	31	$4,495,100	$3,651,500	+ $843,600	Mt. Deb.	31½	11	39½	Nil
	Buenos Ayres Gt. Southern	5,084	13.2.37	231,452	+ 61,164	33	4,522,599	4,172,616	+ 349,983	Ord. Stk.	31¾	13¾	34	Nil
	Buenos Ayres Western	1,930	13.2.37	61,166	+ 9,492	33	1,549,519	1,424,004	+ 125,515	,,	29¾	11	31	Nil
	Central Argentine	3,700	13.2.37	178,505	+ 40,002	33	4,869,860	3,995,495	+ 874,365	,,	32932	8¾	33	Nil
	Do.	—	—	—	—	—	—	—	—	Dfd.	21	4½	17	Nil
	Cent. Uruguay of M. Video	273	6.2.37	17,353	+ 3,308	32	394,868	332,365	+ 62,503	Ord. Stk.	7¾	3	11½	Nil
	Do. Eastern Extn.	311	6.2.37	3,290	+ 611	32	71,854	61,226	+ 10,628	—	—	—	—	—
	Do. Northern Extn.	185	6.2.37	1,913	+ 111	32	49,689	43,357	+ 6,332	—	—	—	—	—
	Do. Western Extn.	211	6.2.37	1,230	+ 120	32	33,042	27,318	+ 5,724	—	—	—	—	—
	Cordoba Central	1,218	13.2.37	26,300	+ 760	33	1,062,400	962,790	+ 99,610	Ord. Inc.	5	1	5½	Nil
	Costa Rica	188	Dec., 1936	19,353	+ 7,331	26	110,934	80,721	+ 30,213	Stk.	36½	32	36	59/6
	Dorada	70	Dec., 1936	17,400	+ 3,400	52	173,900	144,700	+ 29,200	1 Mt. Db.	107	101½	104½	5¾
	Entre Rios	810	13.2.37	11,867	+ 1,573	33	435,060	369,093	+ 65,967	Ord. Stk.	17	6	17½	Nil
	Great Western of Brazil	1,082	13.2.37	8,100	– 2,800	7	60,600	69,900	– 9,300	Ord. Sh.	1/2	5/16	3/4	Nil
	International of Cl. Amer.	794	Dec., 1936	$461,490	+ $2,875	52	$5,112,141	$4,717,456	+ $394,685	—	—	—	—	—
	Interoceanic of Mexico	—	—	—	—	—	—	—	—	1st Pref.	1/2	–/6	1/2	Nil
	La Guaira & Caracas	22¾	Jan., 1937	6,270	+ 1,845	5	6,270	4,425	+ 1,845	Stk.	9	3	7½	Nil
	Leopoldina	1,918	13.2.37	17,475	– 1,833	7	137,195	124,729	+ 12,466	Ord. Stk.	10½	3½	8	Nil
	Mexican	483	7.2.37	$311,600	+ $64,900	6	$1,591,300	$1,323,700	+ $267,600	,,	1¼	1/4	1	Nil
	Midland of Uruguay	319	Jan., 1937	10,650	+ 1,100	31	60,730	48,865	+ 11,865	,,	1½	1/8	1/2	Nil
	Nitrate	397	15.2.37	8,755	+ 4,353	7	20,830	23,461	– 2,631	Ord. Sh.	63/6	41/9	21116	Nil
	Paraguay Central	274	13.2.37	$2,840,000	+ $627,000	33	$87,284,000	$74,376,000	+ $12,908,000	Pr. Li. Stk.	85	71	81	7
	Peruvian Corporation	1,059	Jan., 1937	79,801	– 3,318	31	570,580	537,416	+ 33,170	Pref.	15	9	14½	Nil
	Salvador	100	6.2.37	¢48,500	+ ¢17,600	32	¢598,758	¢544,396	+ ¢54,362	Pr. Li.Db.	18	16	22½	Nil
	San Paulo	153½	7.2.37	31,875	+ 1,392	6	166,849	170,646	– 3,797	Ord. Stk.	86	46½	92½	211/16
	Taltal	164	Jan., 1937	3,590	+ 375	31	24,490	23,915	+ 575	Ord. Sh.	11532	14/–	11/4	8
	United of Havana	1,353	13.2.37	51,152	+ 4,997	33	616,465	585,539	+ 30,926	Ord. Stk.	3¼	1	4½	Nil
	Uruguay Northern	73	Jan., 1937	1,032	+ 138	31	7,529	5,724	+ 1,805	Deb. Stk.	5	3	8	Nil
Canada.	Canadian National	23,564	7.2.37	674,820	+ 73,804	6	3,483,491	3,149,528	+ 333,963	—	—	—	—	—
	Canadian Northern	—	—	—	—	—	—	—	—41 p.c.	Perp. Dbs.	76	51	74	5/16
	Grand Trunk	—	—	—	—	—	—	—	—	4 p.c. Gar.	104¾	99¾	99½	4
	Canadian Pacific	17,223	7.2.37	481,400	+ 45,200	6	2,520,200	2,301,000	+ 219,200	Ord. Stk.	16¾	10516	17	Nil
India.†	Assam Bengal	1,329	20.1.37	43,530	+ 5,268	41	1,065,722	1,008,684	+ 57,038	Ord. Stk.	87¾	82¼	81½	311/16
	Barsi Light	202	20.1.37	3,142	– 1,035	41	93,180	114,975	– 21,795	Ord. Sh.	77½	65½	62½	8
	Bengal & North Western	2,107	20.1.37	84,462	+ 1,004	15	856,852	806,098	+ 50,754	Ord. Stk.	319	292/8	315	511/16
	Bengal Dooars & Extension	161	20.1.37	3,214	– 751	41	107,734	114,779	– 7,045	,,	127½	118	108½	5½
	Bengal-Nagpur	3,268	20.1.37	161,475	– 9,086	41	4,760,332	5,137,326	– 376,994	,,	104	100¼	100½	4
	Bombay, Baroda & Cl. India	3,072	10.2.37	306,675	+ 38,700	44	7,509,975	7,037,025	+ 472,950	,,	114	110½	111½	5/8
	Madras & Southern Mahratta	3,229	20.1.37	174,225	+ 31,567	41	4,481,168	4,300,815	+ 180,353	,,	116½	108½	108½	7/8
	Rohilkund & Kumaon	572	20.1.37	18,906	+ 1,355	15	158,418	151,016	+ 7,402	,,	311	286	312	5¾
	South Indian	2,532	20.1.37	109,465	+ 6,825	41	3,232,376	3,175,033	+ 57,343	,,	107½	10256	101½	57/16
Various	Beira-Umtali	204	Dec., 1936	68,774	+ 5,507	13	206,068	193,193	+ 12,875	—	—	—	—	—
	Bilbao River & Cantabrian	15	Jan., 1937	1,036	– 282	5	1,036	1,318	– 282	—	—	—	—	—
	Egyptian Delta	620	31.1.37	8,265	+ 698	43	214,343	212,780	+ 1,563	Prf. Sh.	21/4	15/8	15/8	Nil
	Great Southern of Spain	104	29.8.36	568	– 2,514	35	33,629	62,623	– 28,994	Inc. Deb.	1½	1/8	3½	Nil
	Kenya & Uganda	1,625	Jan., 1937	289,136	+ 55,760	5	289,136	233,376	+ 55,760	—	—	—	—	—
	Manila	—	—	—	—	—	—	—	—	B. Deb.	50½	37	46	7/8
	Mashonaland	913	Dec., 1936	128,131	+ 28,800	13	373,680	313,033	+ 60,647	1 Mg. Db.	101½	10151/8	107	411/16
	Midland of W. Australia	277	Dec., 1936	14,803	– 39	26	82,053	83,623	– 1,570	Inc. Deb.	97	93½	96	4/8
	Nigerian	1,905	26.12.36	85,375	+ 40,785	39	1,661,635	1,312,173	+ 349,462	—	—	—	—	—
	Rhodesia	1,538	Dec., 1936	221,307	+ 35,843	13	664,648	£575,985	+ 88,663	4 p.c. Db.	107	103½	109	311/16
	South Africa	13,263	23.1.37	620,835	+ 43,482	43	26,191,595	24,298,710	+ 1,892,885	—	—	—	—	—
	Victoria	4,728	Sept., 1936	790,314	+ 984	13	2,242,629	2,238,853	+ 3,776	—	—	—	—	—
	Zafra & Huelva	112	Dec., 1936	16,027	+ 5,302	52	113,343	134,754	– 21,411	—	—	—	—	—

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1/16.

† Receipts are calculated @ 1s. 6d. to the rupee. § ex dividend. Salvador and Paraguay Central receipts are in currency.

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the Sterling weekly receipts at the par rate of exchange has proved misleading, the amount being overestimated. The statements from July 1 onwards are based on the current rates of exchange and not on the par value.

Diesel Railway Traction

"Whitaker" on Diesels

SOME startling figures as to the saving in hard cash effected by the super-speed diesel trains in Germany appear on page 685 of the 1937 issue of the ubiquitous Whitaker, and although we should like to believe that they were true we can hardly refrain from the opinion that possibly the editor is an optimist. Despite the fact that only nine streamlined diesel trains are stated to belong to the Reichsbahn, compared with the 18 which actually have been in service since about September last, they are credited with saving the railway a sum of no less than £2,000,000 a year, that is, over four times their first cost. If it is considered that this figure is a misprint for RM. 2,000,000 it would mean a saving of 4s. 6d. per train-mile, assuming nine cars running the scheduled mileage, or 2s. 3d. per train-mile assuming 18 cars with their correct mileage. The latter is feasible, but it is probable that the sum of £2,000,000 a year refers to the saving in operating costs effected by the whole of the 300-odd Reichsbahn diesel railcars and trains of all types. These arguments, of course, are mere conjecture, but whatever the true financial saving, even supposing that this is known to the responsible officers, it is of sufficient magnitude to warrant a continuous extension of the diesel programme, as described in the last issue of this Supplement by the Reichsbahn railcar chief, Herr Stroebe.

Diesel Mileage

FREQUENT claims are made that an outstanding advantage of oil-engined units is the greater mileage they can put up compared with steam locomotives, but just what mileage is possible does not seem to be widely appreciated. If the L.N.E.R. Silver Jubilee is taken as the acme of steam working, it will be seen that the carriages forming the single train now in existence cover a distance of 138,000 miles in a year if they operate on every scheduled day, but of course several locomotives are used in the course of twelve months. Elsewhere in this issue we give particulars of a diesel train which actually covers approximately 160,000 miles a year over a route only 44 miles long, and much greater mileages are built up by trains operating on long-distance turns. For example, there are now eight trains of the Zephyr type operating on the Chicago, Burlington & Quincy Railroad; the oldest has been in service less than three years, the newest less than three months, but the aggregate mileage to date is approximately 2,100,000. Both of the three-car trains which operated the 66 m.p.h. Chicago-Twin Cities service before the present seven-car trains were introduced in December last have exceeded the half-million mark, although they were not put on the rails until April, 1935; that is, their actual mileage is at the rate of 290,000 a year. The original Burlington Zephyr, set to regular work in November, 1934, and operated on 55 to 60 m.p.h. schedules, has a total 465,000 miles to its credit, or at the rate of 190,000 miles a year in normal service. Nearer home the German 820 b.h.p. streamlined trains make 100,000 to 150,000 miles a year, and although in all the above examples the schedule speed is high and the hours in service therefore low compared to the distance, there are still more cases in which diesel trains or railcars operate at lower speeds and make mileages of 70,000 to 90,000 miles a year on traffic of the semi-fast class.

A Lubrication Note

ANYTHING which Mr. H. R. Ricardo says upon the subject of high-speed oil engines is worth close attention, and usually he has a pleasing habit of putting the truth neatly. Speaking before the Institute of Fuel a couple of days ago he touched on the subject of lubrication, and emphasised that the problem was not that of conveying an adequate supply of oil to the rubbing surfaces, which, after all, was merely elementary plumbing, but rather to achieve adequate lubrication without flooding the cylinder walls. Referring to bearing lubrication in high-speed engines, Mr. Ricardo brought before his hearers a point which is not fully appreciated among railway staffs, more especially on small lines, where of necessity the diesel vehicles are rarely under the supervision of a trained engineer; that is, the cooling function served by the oil in addition to its lubricating duties. With high-speed engines the combination of load and rubbing speed is so high that the heat generated by friction cannot be dissipated by conduction, and forced lubrication must be incorporated and a large quantity of oil kept moving through the bearings at high velocity solely in order to carry away the heat. Sump cooling of the oil is standard on numerous engines, usually with an enlarged sump for railway applications, but there is an increasing number of models in which this method is being given up in favour of radiator cooling, even in relatively small sizes.

Fire Risks

ALTHOUGH among the advantages of diesel units compared with steam vehicles may be ranked a reduced risk of causing fires in lineside and adjacent property, there is still a certain fire hazard present within the diesel locomotive itself, though of course much less than in a petrol vehicle. In practice, the fire risk, although of small magnitude in any case, is greater in locomotives than in railcars, mainly because of the larger sizes and more inconvenient location of fuel tanks and more elaborate fuelling equipment. It has been established in certain countries, at least, that the principal cause of outbreaks is overflow of fuel through the tank vent pipes, and both tank and pipes are generally located in the engine room. The remedy is not to remove the equipment to a position where an overflow means simply an oily mess, but to provide proper metering equipment on the tanks in such a position that observations can be made without the necessity for acrobatics or contortions. It is due to the easy observation and filling of railcar tanks that these vehicles are more immune from fire than are locomotives, but on the basis of prevention being better than cure it is better to issue instructions to the staff covering the correct procedure in fuelling and emphasising the care with which such operations should be conducted.

BRITISH-BUILT RAILCARS FOR SOUTH AMERICA

Twin power installations and mechanical transmission are features of a general purpose design

255 b.h.p. Gardner-engined railcar for solo operation

THE first of the eleven standard-gauge railcars ordered by the Entre Rios Railways from the Birmingham Railway Carriage & Wagon Co. Ltd. has been finished, and during January ran a short trial trip on the Great Western line between Gloucester and Standish junction. These all-metal bogie cars, designed under the direction of Messrs. Livesey & Henderson, have accommodation for 18 first class and 36 second class passengers, with lavatories in each class and a common buffet compartment. The cruising speed is about 60 m.p.h. and the top speed 65 m.p.h.; the cars are intended for use both on long-distance main line and shorter distance services.

The body pillars are of light U-section steel and form a continuous hoop round the body. Aluminium side and roof sheets are riveted to the pillars, and the nose, carried down to form a cowcatcher, is suitably reinforced for this function. The floor is formed of galvanised dovetail sheeting covered with treated cork, and finished with rubber.

Insulation against temperature change and noise is ensured by means of sprayed asbestos, which is applied to the inside of the outer aluminium sheeting and the back of the interior lining. The underside of the dovetail flooring is also sprayed with asbestos finished with a hard surface of cement. Stone's pressure ventilating and heating system is fitted, and is capable of maintaining a fresh air condition, free from dust or draught, in all seasons of the year. In cool weather the temperature of the air is brought up to the required level by means of thermostats arranged to control the heat imparted to the incoming air. The heat is taken from the engine cooling water, which is diverted from the radiator, the diverting valve being thermostatically-controlled to avoid overheating of the engine when the heat is not absorbed by the air passing through the ventilating system. The ventilating and heating equipment is housed in a cabinet in the luggage compartment, the air being drawn through a louvre in the body side and conveyed from the cabinet, after being filtered and heated, along insulated ducts situated in the underframe, from which it is forced into the passenger compartment through discharge apertures in the seat legs. Exhaust apertures are provided in the roof. In addition to the pressure ventilating system, the electric lighting equipment and the heating equipment in the buffet compartment are of Stone's manufacture. The outside of the car is finished in Docker Bros.' Syntholux paint of brilliant yellow colour, with a black line along the waist and round the nose of the vehicle. The underframe is built in one with the body, of high elasticity steel, fabricated by welding. The engines are suspended from the underframe on subframes of high elasticity steel, which rest on balata pads.

The bogies are of the car builder's patent design, giving exceptional room in the centre for the transmission. They are of welded construction and fabricated of high elasticity steel. The springing comprises four laminated springs over the axleboxes, with rubber auxiliaries seated in cups fabricated on the solebar; helical springs suspended from the bolster outside the solebars carry the body. The axleboxes are of Timken roller bearing type. The brake drums are bolted inside the wheels and the wheel discs

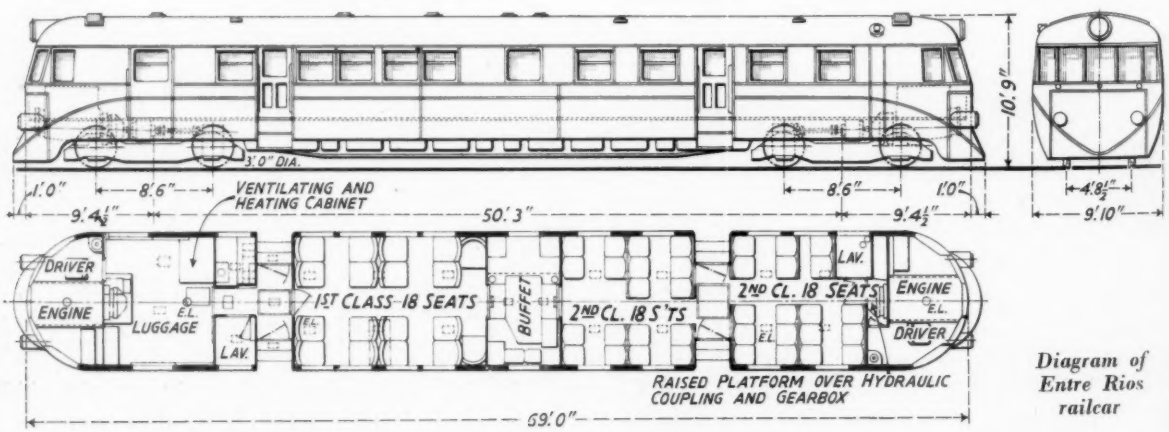
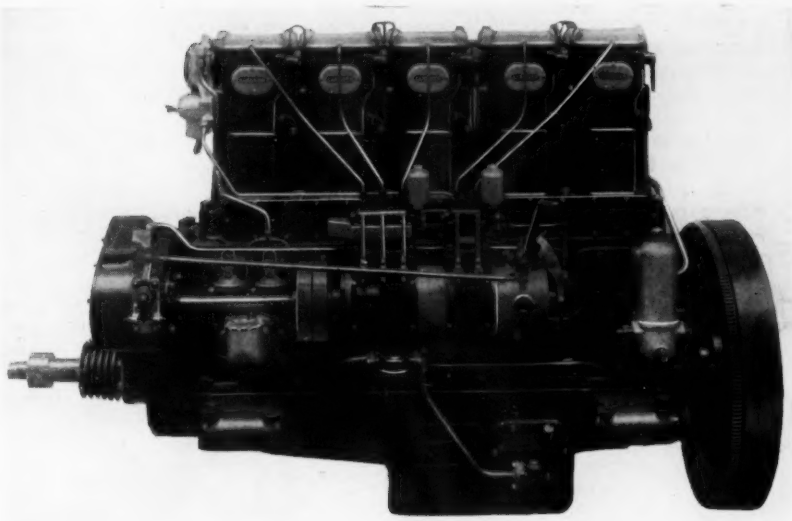


Diagram of Entre Rios railcar



Five-cylinder Gardner engine forming the power unit of the eleven railcars built for the Entre Rios Railway by the Birmingham Railway Carriage & Wagon Company. The rated output is 127 b.h.p. at 1,200 r.p.m.

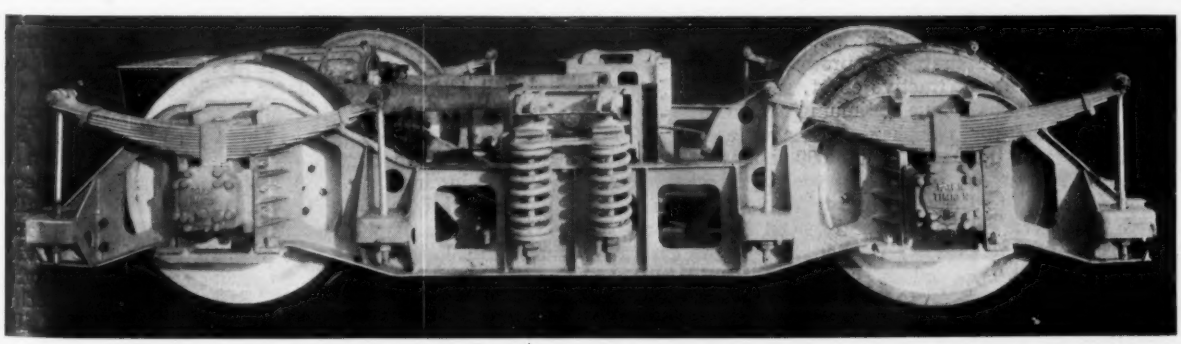
are sprayed with asbestos to eliminate ring. The brakes are of the Girling type, and the compressed air is obtained from a compressor driven direct from one engine by Brammer belts. This air system also feeds the control system for the gear and direction change control. Brackets are fabricated on the outer headstock and bolster of each bogie from which the engine subframe is supported when running the whole transmission out for a major overhaul.

Power Units and Transmission

Each of the two bogies has its own power and transmission plant, the engine being on the underframe above. The engine at each end is of the Gardner 5L3 type developing a maximum rated output of 127 b.h.p. at 1,200 r.p.m., with a brake m.e.p. in the five cylinders of 91 lb. per sq. in. and a fuel consumption of 0·4 lb. per b.h.p. hr. The cylinders are cast in special iron in blocks of two and three and have cast iron wet liners fitted. The cylinder heads are separate iron castings. Heat-treated cast aluminium alloy is used for the pistons, which work with forged steel connecting rods having loose big end shells lined with white metal. C.A.V.-Bosch fuel pumps are used and the injection is of the direct type. Electric starting is used. Large Visco air filters are fitted to each engine to counteract the dusty atmosphere in Argentina. The engine circulating water and lubricating oil are cooled in radiators made by the Spiral Tube & Components Co. Ltd., which have fans driven direct from the engines by Brammer belts.

The transmission for each engine consists of a Vulcan-Sinclair fluid coupling; a four-speed Wilson epicyclic gearbox; a Hardy-Spicer propeller shaft; and a Bostock & Bramley combined forward and reverse box with a final worm drive on the inner axle of each bogie; the outer axles are not driven. The gear change and forward and reverse controls are electro-pneumatic, and the controller is situated under the instrument panel in the driver's compartments. The controls are mechanically interlocked so that it is impossible to engage a gear with the forward and reverse control in neutral, and also impossible to engage a direction unless the gearbox is in neutral. An overspeed governor is fitted on the gearbox, which, in the event of a mistake on the part of the driver in changing down at too high a speed, and thus tending to make the car drive the engines above their maximum revolutions, automatically places the gears in neutral; the governor has to be reset by hand before the gears can be engaged again. The Wilson epicyclic gearboxes have ratios of 4·08, 2·33, 1·49, and 1·0 to 1, and are arranged for operation by compressed air at about 60 lb. per sq. in. The entry and exit of the air to and from the gear operating cylinders is controlled by electro-magnet valves which operate on a 24-volt circuit.

The Bostock & Bramley forward and reverse gear unit consists of a driving shaft on which are mounted the gears required for the correct direction of rotation of the rear wheels and the worm shaft. Below the worm is situated the worm wheel which is directly connected to



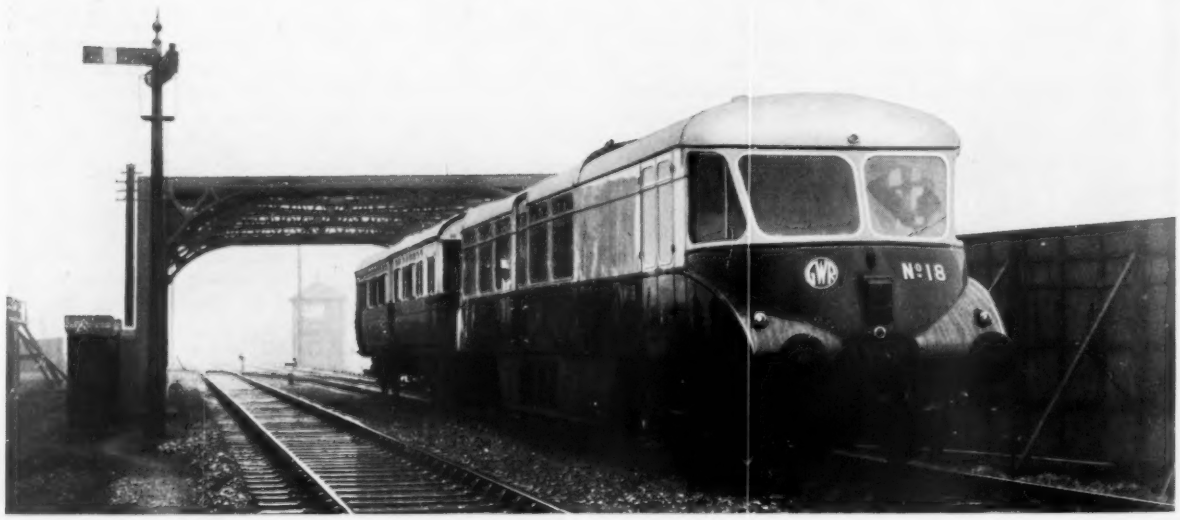
Bogie designed by Birmingham Railway Carriage & Wagon Co. Ltd. for diesel railcars

the axle. Two electro-pneumatic valves are mounted on the box, and when current is passed through one or the other an air valve opens and permits air to enter the cylinder, the piston of which actuates the gear shifting shaft and brings into mesh whichever of the direction gears is required. The complete gear is lubricated by oil from the bottom sump casting.

As it was desired to have the speeds of the two engines definitely synchronised, the Exactor type of hydraulic remote control was fitted. The principle used in this device is that of the transmission of movement by means of a column of oil which is kept under pressure by opposing springs situated respectively in the transmitting and receiving portions. The operating lever imparts a movement to the transmitter piston which is reproduced exactly in the receiver piston; in turn, this operates the controlled medium accurately and without backlash or lost motion. Temperature variation and leakage are compensated for by a synchronising device.

The drivers' cabs are identical, and each has a driver's seat with an instrument panel in front, together with the engine control lever and brake lever. A dead man's handle fitting is incorporated in the engine control lever, and a separate foot-operated dead man control pedal is let into the floor. There is also a sanding pedal, and a hand brake lever, and the instrument panel carries the usual complement of instruments and gauges, including the engine starter push buttons. A switch panel is placed adjacent to the driver's right hand. The headlights can be pivoted in a horizontal plane by the driver, who controls this by a foot treadle immediately in front of him.

New Great Western Railcar for Trailer Haulage



The new A.E.C. diesel-mechanical railcar at work

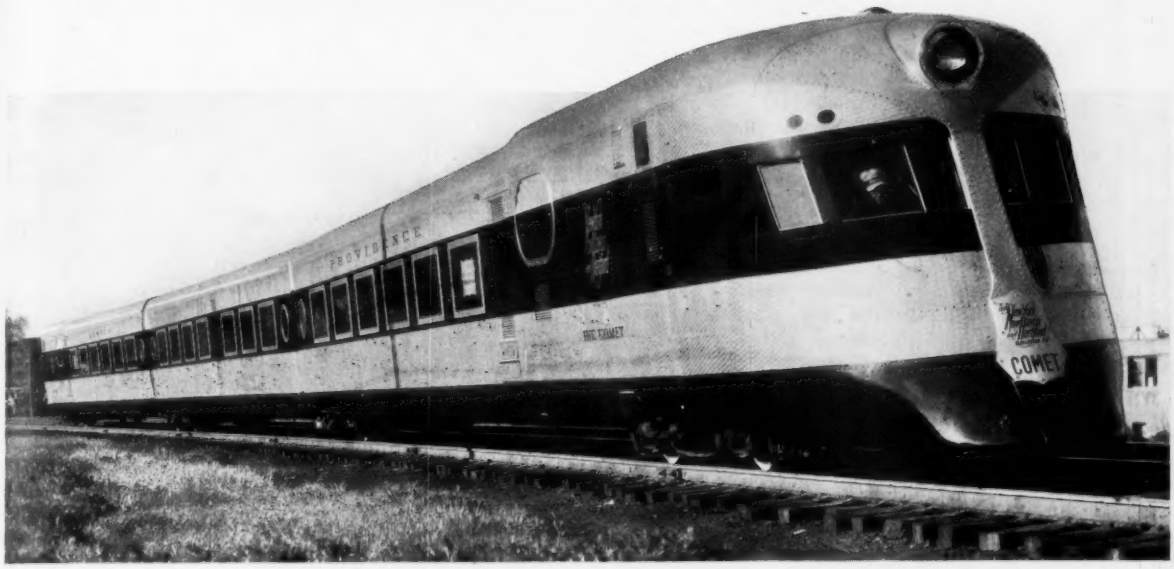
THE last of the eleven 260 b.h.p. A.E.C. diesel-mechanical railcars ordered by the Great Western Railway has been delivered and is about to begin operation on the Lambourn valley branch. Delivery has been delayed because in contradistinction to the preceding ten cars of the order—and indeed to all the 17 preceding G.W.R. railcars—trailer haulage was stipulated, and some investigation was desirable to produce to a nicety the combination of speed, tractive effort, seating and luggage capacity which would give optimum performance.

Normally the car will haul passenger and/or goods vehicles up to a trailing weight of 60 tons, and standard buffing and drawgear is fitted to the headstocks. Both the underframes and bogies have been strengthened compared with those of the other cars, which operate alone. There is a driving position at each end of the car, and equipment has been fitted so that any future installation of multiple-unit control can be carried out easily. Provision is made for steam-heating of trailers and for operating the standard vacuum brake on such stock. No. 18 car itself is fitted with a vacuum brake, but the equipment includes one cylinder per wheel operating on brake drums and not the usual large conventional vacuum brake cylinder.

The car provides seating accommodation for 49 passengers in two saloons opening out of a centre vestibule. At one end of the car is a driver's compartment and at the other a combined luggage and driver's compartment. The interior woodwork is natural-colour polished oak; seat ends, bulkheads, walls and ceilings are covered with Rexine or fancy fabric to match, and the seats are upholstered in figured moquette. The floors are laid with linoleum and brown carpet along the corridor between the seats. Illumination is by a diffused system of electric lighting and a new type of ventilation has been installed.

Overall, the car length is 65 ft. 8 in., about 2 ft. longer than the solo vehicles. The propulsive power is provided by two 130 b.h.p. A.E.C. oil engines the torque of which is transmitted through Wilson epicyclic gearboxes and the usual A.E.C. side drive. Full technical details and illustrations of the power plant, bogie and chassis were given in the issue of this Supplement for November 29, 1935.

The Design, Construction and Operation of a Streamlined Diesel Train



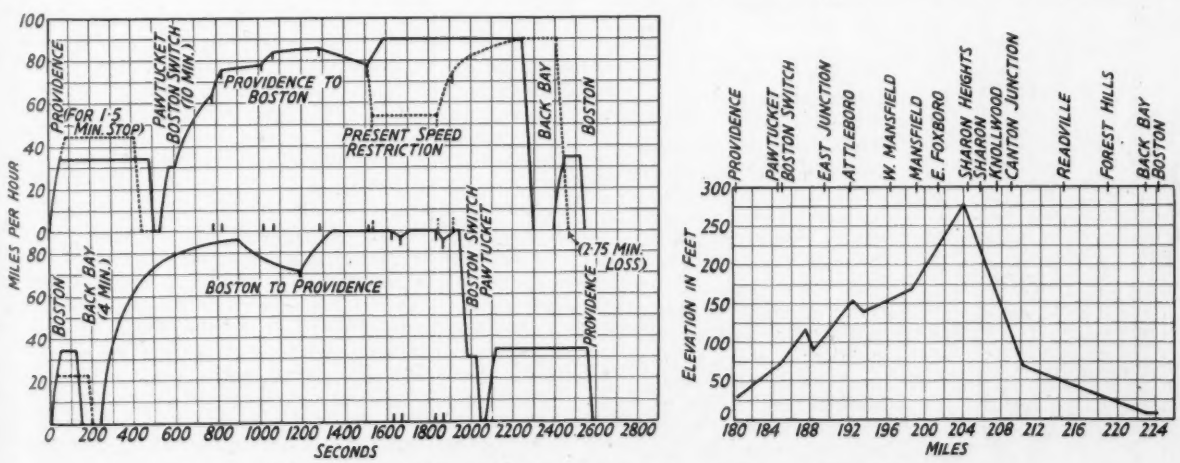
The 800 b.h.p. Comet of the New York, New Haven & Hartford Railroad

THE triple-car 800 b.h.p. train named The Comet which was described in the issue of this Supplement for May 17, 1935, has since been running in regular service on the New York New Haven & Hartford Railroad between Boston (Mass.) and Providence (R.I.), maintaining a 60 m.p.h. schedule over the 43·3 miles, a duty for which it was specifically designed. It is the only American streamlined diesel train to have a driving cab at each end, a feature dictated by the short end-to-end run which otherwise would have necessitated ten turn-rounds a day.

Operation

The Comet went into regular service between Boston and Providence on June 5, 1935, after it had made a total of about 4,500 miles on special demonstration trips. From that date up to September 28 of the same year it was scheduled to make five round trips each weekday aggregating 440 miles. From September 29, 1935, onwards the duty was raised to six round trips a day, totalling 528 miles, and an additional stop at Central Falls (Pawtucket) was inserted without any increase in the overall time. On alternate Sundays it made excursion trips from Boston to New York.

Up to the time the train was withdrawn from service, for annual repairs and to meet Interstate Commerce Commission requirements on April 22, 1936, it had covered 133,000 miles in regular service. The hours of operation of the diesel engines for the ten and a half months of revenue service totalled approximately 4,500. The fuel consumption averaged about 3·5 lb. per mile and the lubricating oil consumption about 72 m.p.g. (English gal.). A complete change of lubricating oil was made every 25,000 miles. Despite the large amount of time spent with the engine idling, owing to the operating instructions calling for this during all lie-over periods of less than an hour, and to certain periods of light load merely to keep the air-con-



Speed-time curve of The Comet's run, and the gradient profile of the line

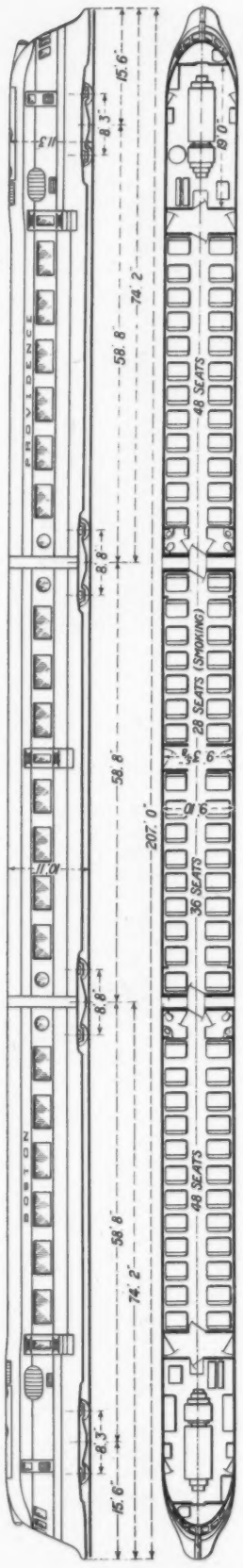


Diagram of the 800 b.h.p. Comet train used in fast interurban service by the New York, New Haven & Hartford Railroad

ditioning plant functioning, the dilution of the crankcase oil was only about 2·5 per cent.

Although The Comet had to be taken out of service several times for short periods for defects, its operation was most satisfactory. Included in the work necessary was the rewinding of the fuel pump and evaporator fan motors for 140 volts in place of the original 115 volts to accommodate the voltage of the auxiliary generators; one of the traction motors failed in September, 1935; certain bushings in the hydraulic shock absorbers showed excessive wear and were replaced by others of different material; and additional supports for the truck brake rigging were fitted. The Westinghouse engines gave exceedingly good service. On one occasion, through failure to use the button provided to cut out a defective thermostat switch, all but 3 in. of cooling water were boiled out of one engine without any more serious damage than the necessity for replacing two cylinder head gaskets a short time later. During the first annual shopping the cylinder heads and pistons were inspected, and all piston rings were renewed as a matter of policy; the valves were ground in, the cylinder liners checked, all the rod and main bearings inspected and adjusted, the timing checked and the injection nozzles reconditioned, the crankcase thoroughly cleaned, and gaskets renewed as required. The main and auxiliary generators and motors were dismantled for inspection of the ball bearings, reinsulation and protection of leads, skimming-up of the commutators, and adjustment of brush holders, bearings, &c. The mechanical portion of the train had stood up very well to the arduous service, and although certain small details such as sand pipe brackets, motor-nose suspension bracket liners, and axlebox guide liners had to be renewed, no structural attention whatever was required by the superstructure.

After the overhaul The Comet was returned to service during the summer of 1936 and made its six round trips on weekdays between Boston and Providence until September 27, when owing to the winter timetable change only five round trips a day were scheduled, plus Sunday excursions. When the Comet is out of service for any defect, two standard passenger cars and three Atlantic steam locomotives are required to maintain the 60 m.p.h. shuttle service, largely because of the short turn-round times and the crew rosters.

The normal schedule is 44 min. inclusive of stops at Back Bay and Pawtucket in each direction. Running out of Boston the time allowed from the start to the re-start from the Back Bay stop, 1·28 miles, is 4 min. In the reverse direction the train is expected to clear Boston Switch, 4·9 miles, in 10 min. from the Providence start and including the Pawtucket stop. The speed limit over the line between Pawtucket and Back Bay is 90 m.p.h., but when the train went into service there was a 55 m.p.h. slack in force for south-bound trains over a distance of $4\frac{1}{2}$ miles in the normal 90 m.p.h. zone, and the loss due to this restriction was reckoned at $2\frac{3}{4}$ min. Speed-time curves for each direction and a condensed profile of the line are shown in an accompanying illustration. Along with the electrical data given later, they are due to Mr. A. H. Candee,* of the Westinghouse Electric & Manufacturing Company. The details of the design and construction of the mechanical portion are from Dr. Karl Arnstein† of the Goodyear-Zeppelin Corporation, the builder of the train.

The Comet weighs 126 English tons in working order. Power is provided by two 400 b.h.p. Westinghouse engines, and the power-weight ratio is thus 6·35 b.h.p. per ton, this value including the power which is necessary for auxiliary drives. Normally, a speed of 60 m.p.h. can be attained in about 140 sec. from the start. Preliminary tests before the train was turned over to the owning railroad showed that over a level track the acceleration rate at 40 m.p.h. was 0·38 m.p.h.p.s.; at 60 m.p.h. it was 0·225 m.p.h.p.s.; at 80 m.p.h. it was 0·125 m.p.h.p.s.; and at 90 m.p.h. it was 0·06 m.p.h.p.s. A top speed of 110 m.p.h. has been attained, and 98-99 m.p.h. maintained up a 1 in 440 grade.

Aerodynamical Problems

Although The Comet is nearly two feet lower in overall height than an American standard passenger car, the height of the saloons is only about 14 or 15 in. less, for the floor has been lowered to $32\frac{1}{2}$ in. above rail. As shown in the accompanying cross section of the body, the interior width is well over 9 ft., giving space for two 43-in. double seats on each side of a 26-in. central aisle. The centre of gravity of the train complete with supplies but without passengers is 50 in. above rail level.

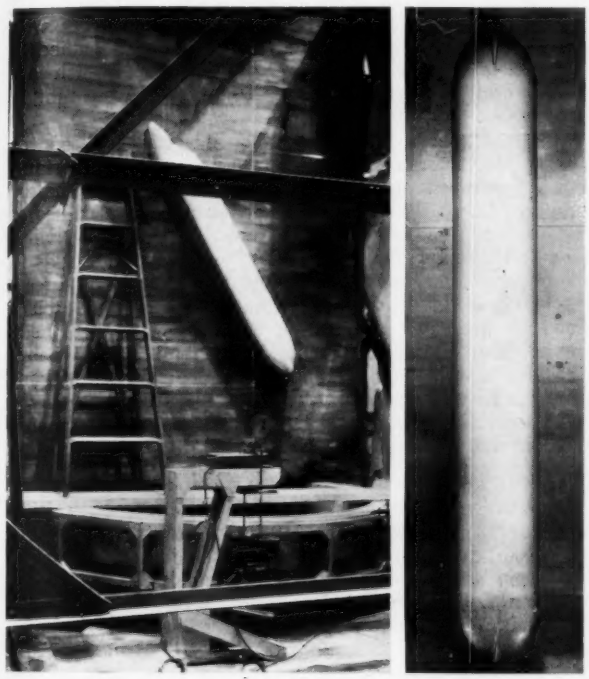
Maximum strength with minimum weight and power absorption was a primary consideration in the design and in both the constructional principles and the streamlined shape the Goodyear-Zeppelin Corporation drew on its experience with airships. The outside of the train is smooth and has well-rounded corners; the side panels are carried round underneath and cut away only round the trucks; the fixed windows are set flush with the outside panels; the ends are as close to a good aerodynamical form

* In a paper read before the American Institute of Electrical Engineers, 1935.

† In a paper by Dr. Karl Arnstein reproduced in *Mechanical Engineering*, August and September, 1935.

as practical railway conditions, including double-end drive, permit; there are no outside grab handles or footsteps to increase the air resistance; the articulated ends of the cars are covered by full-width rubber diaphragms; and the rivets, although not countersunk, have heads of special design to give adequate strength in conjunction with low height.

Extensive wind-tunnel tests were undertaken at the Daniel Guggenheim Airship Institute to indicate solutions to certain definite questions. The air resistance of a train is made up of several quite separate influences whose relative magnitude may be quite different in a wind-tunnel model and in a full-sized train unless special preparations are made and various devices fitted. The main influences affecting the air resistance of high-speed trains of the diesel type are: (*1*) the shape of the head and tail, which



Models of The Comet under test in the wind-tunnel at Akron

affects the form drag; (*2*) the length, shape, and exposed circumference of the body, which controls the smooth skin friction drag; (*3*) the roughness of the skin where exposed to free air flow; (*4*) the drag of projecting parts such as buffers, headlamps, grab handles, &c.; (*5*) the air friction between the bottom of the vehicle and the ground, and the air resistance of the trucks; (*6*) the impulse drag of radiator air intake, engine air intake, and exhaust outlet, and the influence of these disturbances of the outer air flow upon the form and friction drag; (*7*) atmospheric influences such as air density and winds.

As each end of The Comet had to be the same to suit the double-end drive it was impossible to incorporate the slender tail dictated by aerodynamical considerations, and the complicating effects of making both ends of such a shape were not deemed worth while, although The Comet is by no means a lengthy train. The influence of the tail shape, of course, decreases with increasing train length.

As it was thought possible that the efficiency of the tail contours in keeping the wake small might depend upon the relative thickness of the friction boundary layer accumulated at the rear end of the cylindrical portion of the

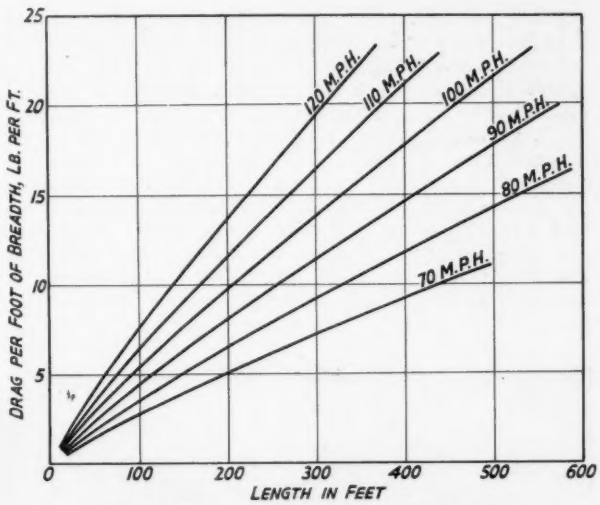
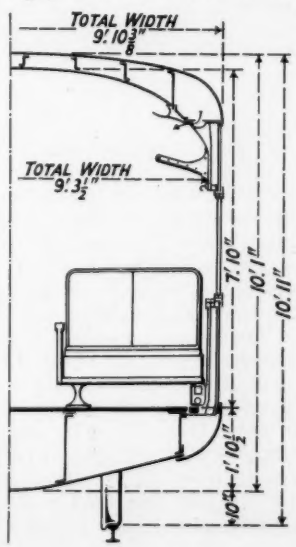


Chart showing drag of a smooth flat plate

train, one of the models was equipped with a collar of tapered quills projecting from the body at the end in order to ensure turbulence of the boundary-layer flow and to promote an artificial increase in the thickness of this layer down stream. It was hoped that this would have an effect upon the flow round the tail end similar to that of a much longer train, but no definite proof of this theory was obtained.

In most of the tests in the wind-tunnel a ground board was used, and in addition several velocity-head traverses were measured on it in the absence of the train models, in order to obtain information on the boundary layer which builds up on the board itself It was proved that the boundary layers between the board and the bottom of the model did not grow together even in the longest models tested. Streamer tests revealed some flow divergence beneath the car floor.

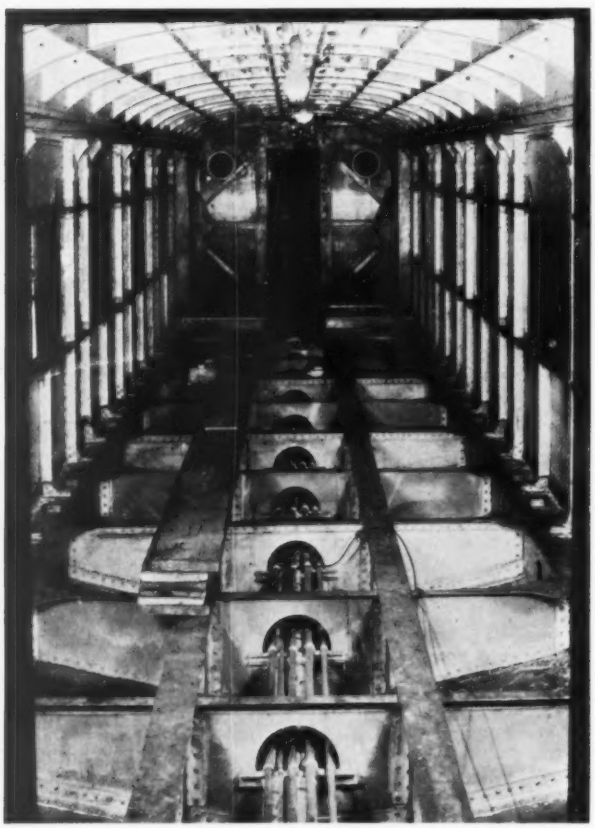
Skin friction is responsible for a good part of the whole air resistance. No attempt was made to determine the skin friction on models of trains, but in making computations for The Comet Von Karman's theory of skin-friction drag was used. The results of the calculations for normal train lengths and speeds are indicated in an accompanying illustration. The drag per foot of breadth or



Section through the body of one of the cars of the New York, New Haven & Hartford Railroad's diesel-electric train, The Comet

exposed circumference increases at a slightly smaller rate than the length and velocity head. For short-range interpolation between lengths of 200 and 400 ft., and between speeds of 70 and 120 m.p.h., the drag per unit of breadth appears to be approximately proportional to a length about 50 ft. greater than the train length and to the square of a speed about 7 m.p.h. higher than the train speed.

Smooth though the surface of The Comet is, true aerodynamic science regards the small recesses, rivet heads and bevelled plate butt joints as scattered roughness. Karman's theory of friction of a rough plate indicates that for a train speed of about 100 m.p.h. roughness measured in terms of a mean height parameter of less than about 0·001 in. in the forward part and 0·002 in. in the



Body frame structure of The Comet

rear part of a long train would still be aerodynamically smooth. Longitudinal rivet rows have some remote resemblance to artificially roughened surfaces for which accurate experimental data are available. On The Comet probably only a small percentage of the entire windswept surface is roughened to an effective degree. Individual projections through the boundary layer into free air can be tested in a wind tunnel.

The friction between the real car bottom and the ground changes its character behind the point where the boundary layer of the bottom reaches the ground. The boundary layer on a smooth surface travelling at 100 m.p.h. grows to a thickness of 12 in. about 50 ft. behind the leading edge, and to a thickness of several feet in the rear part of the train. The thickness is not well-defined, as the air dragged along flows in eddies and mixes with the air beyond the boundary layer.

Although attempts to duplicate air flow in definite conditions beneath the car in a wind tunnel did not result in definite data being obtained, efforts were made to conceal certain truck constituents and auxiliaries in recesses. Some explorations of velocity made during trial runs of The Comet itself confirmed that little of the truck structures protruded into a high velocity air stream. Appreciable parasitic drag can be introduced through lost momentum and disturbance of regular air flow if the air supply to radiators, engines and ventilation system is arranged without any regard to aerodynamics. In The Comet, as in all other trains, a compromise had to be struck because of the limited choice of location for intakes and exhausts, but interesting wind-tunnel experiments were undertaken with a model equipped with a miniature blower and screens arranged to simulate the flow round radiator fans and through ducts. They indicated that a very decided benefit is to be derived from louvres with curved guide vanes, and from the information gained in these tests it was possible to design vanes which are automatically reversed when the direction of train motion is reversed.

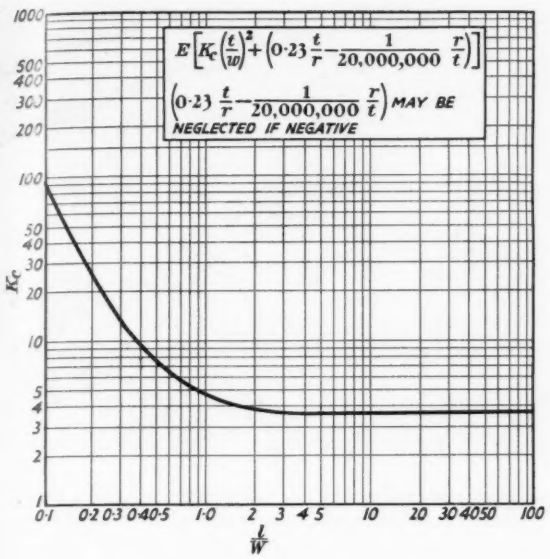
As train speeds are increased and weight reduced the lateral forces from side winds become more important. For a given shape these side forces are approximately proportional to the forward speed for moderate values of the resultant angle of yaw.* When a strong side wind blows on the train from the inner side of a curve it adds to the overturning moment of the centrifugal force and affects the problems of safety and stability, especially if oscillations are present. Therefore it was deemed wise to keep the height of The Comet low and to make the roof smooth and give it well-rounded edges above the cantrail. Wind-tunnel tests were made on models of the Comet to obtain the lateral air force, the rolling moment, and the yawing moment due to side wind combined with forward speed.

Car Construction

The entire outside framing of The Comet, comprising side panels, roof, and bottom plates, acts as one of the main load-carrying elements of the structure, a principle known in aircraft work as the stressed-skin type of construction. The car body resembles a square tube, with the four rounded corners reinforced by longitudinal booms of tubular cross-section running the entire length of the car. These four longitudinal members are connected by transverse floor members, by carlines in the roof, and vertical posts along the side panels, and at the outer ends of the power cars the two lower members are brought together in the form of an arch. The vertical and transverse members make up continuous transverse frames which are interconnected by light longitudinal members in the top, bottom, and in the side walls. The arrangement of the various members and the thickness of the panel plates were chosen so that no warping of the plates would take place under the most severe loading which could occur in service. The outer plates are divided into panels by the longitudinal and cross-wise members.

In determining the thickness of the side, roof, and bottom plates to prevent buckling under shear, compressive, or combined loads, all known investigations were studied in conjunction with the experience of the Goodyear-Zeppelin Corporation, and the results in summarised form are shown by the three curves reproduced, which represent reasonable estimates of the average stresses at which buckling will occur in panels of the smoothness and with the edge support present in the type of construction exemplified by The Comet. In general, experi-

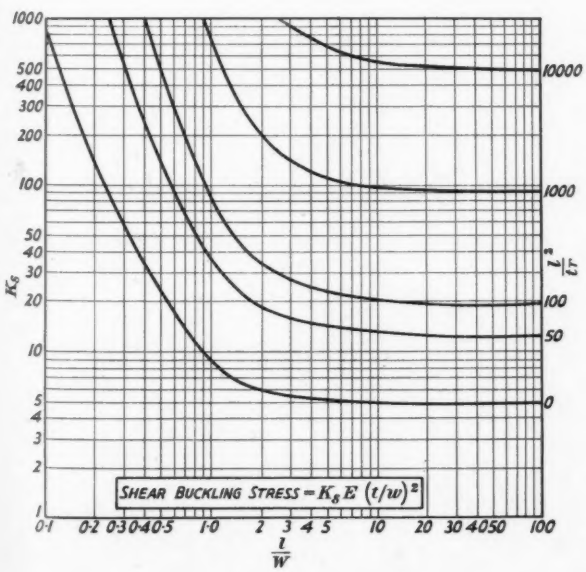
* The angle of yaw is the angle made by the resultant of the lateral and longitudinal components of the air resistance and the train.



Critical compressive stress in panel plates

mental buckling strengths are below the theoretical values, especially in respect of the effect of curvature on the compressive resistance. In the first of these charts is given a formula for the critical compressive stress in terms of the modulus of elasticity of the material, E; the thickness of the sheet, t; and the width, length and radius of curvature, w, l, and r, of the panel. The value of the factor Kc is found from the curve itself. Similarly the second chart deals with the critical shear stress, and the third chart shows what percentage of each of these critical stresses can be combined before buckling occurs.

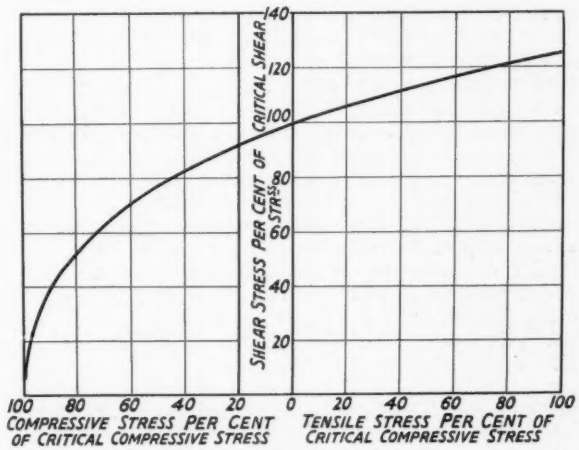
Diagonal shear members are used in the side walls of The Comet only near the articulated ends of the cars, where they help to distribute the concentrated truck reactions. Rigid bulkheads are provided at the ends of the cars and in the centre on each side of the entrance and exit vestibules. In conjunction with stressed-skin construction this



Critical shear and buckling stress in panel plates

gives the car body great lateral and torsional stiffness, and the four longitudinal booms add to the bending and collision strength and offer good protection in case of derailment or overturning.

Aluminium alloys were chosen for most of the structure. It was considered that for a given weight such materials allowed the use of structural elements of greater ruggedness and stiffness than would be possible with high-grade steels. This is of particular advantage in stressed-skin construction. Aluminium alloy sheets lend themselves readily to the forming of the various curved surfaces associated with streamlining. For the panelling No. 52S½ H alloy was utilised; compared with normal alloys it has a greater resistance to corrosion and a higher endurance. For the heavier structural members various extruded sections were used. Aluminium alloys were considered also to provide additional safety in case of collision, as the material will absorb more energy under the same impact conditions than steel, by reason of its lower modulus of elasticity. The rivets used in The Comet are of aluminium alloy 53S W which has a shear strength of 22,000 lb. per sq. in. Most of the rivets used in the main car structure are



Combined critical stresses in panel plates, as obtained from the two previous diagrams

of ⅜-in. dia., with ¼-in. rivets for the auxiliary members and ½-in. rivets in a few places where great strength was required.

The end sills are T-shaped with the top of the T extending over the full car width and the leg running about 6 ft. down the centre line of the car. It is of welded Cromansil steel construction. The cross member is connected to the two lower longitudinal booms; it ties into the end bulkhead, and also carries the side bearers for the articulation bogie. The longitudinal member facilitates the distribution of stresses acting on the end sill; it is connected with the lower booms by heavy shear plates and by a heavy cross member under the floor to a strong post on each side of the car body. These posts are part of a strong frame, and in conjunction with the end bulkhead serve to transmit all vertical reactions and moments to the side panels of the car.

In the end cars the framing at the outer ends includes a welded steel bedplate for the 400 b.h.p. engine, and this rests on the longitudinal tubular members which are specially reinforced at this point to take care of the greater weight. The bedplate is 20 ft. long and 11 in. deep and serves as the lower half of the crankcase of the engine; it is formed by a top and bottom plate reinforced with longitudinal and transverse stays which incidentally

provide a series of compartments for the storage of fuel, lubricating oil and water.

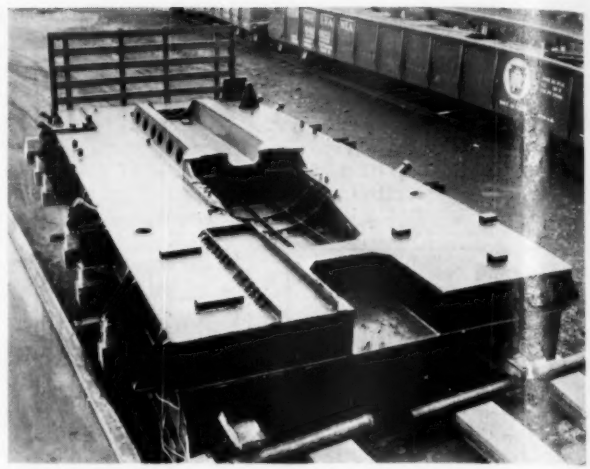
Suspension and Bogie Design

It was recognised that something different from the equipment of a standard passenger car was necessary for the suspension of the car bodies and bogies of The Comet if safe and comfortable riding were to be obtained up to the highest speeds. This was accomplished in the main by replacing the usual laminated springs by hydraulic shock absorbers. These shock absorbers and the method of their application have almost eliminated the rolling motion of the car bodies and have provided greater stability and damping of oscillations.

Three salient points contributed to the desirability of a truck different from the standard types. First, low deadweight causes larger variations of the centreplate loading between the light and fully-loaded conditions, and the problems peculiar to low ratios of car body to truck weight may be enhanced for low deadweights. Secondly, the low centre of gravity of the train. Thirdly, the high scheduled speed and the high maximum speed maintained over a goodly portion of the normal journey, since track impacts increase in magnitude with increase in speed.

Research in various countries indicated that oscillations with a frequency of less than one cycle per second accompanied by a small rate of change of acceleration are not fatiguing to the human body, even with occasional acceleration peaks to 0·1*g*. On the other hand, a variety of motions superimposed upon each other are markedly unpleasant. For greater passenger comfort it appeared desirable to minimise the roll, as it is not necessary for energy absorption. Cars with a low centre of gravity vary in this respect from conventional cars, where a small angular displacement on the spring suspension gives a greater amount of travel at the centre of gravity. The rolling frequency of the body increases as the centre of gravity is lowered, and the roll of such a train has little effect on the absorption of lateral rail shocks. As may be seen from the appended illustration of the bogie the wide spring base of The Comet was utilised to reduce the roll.

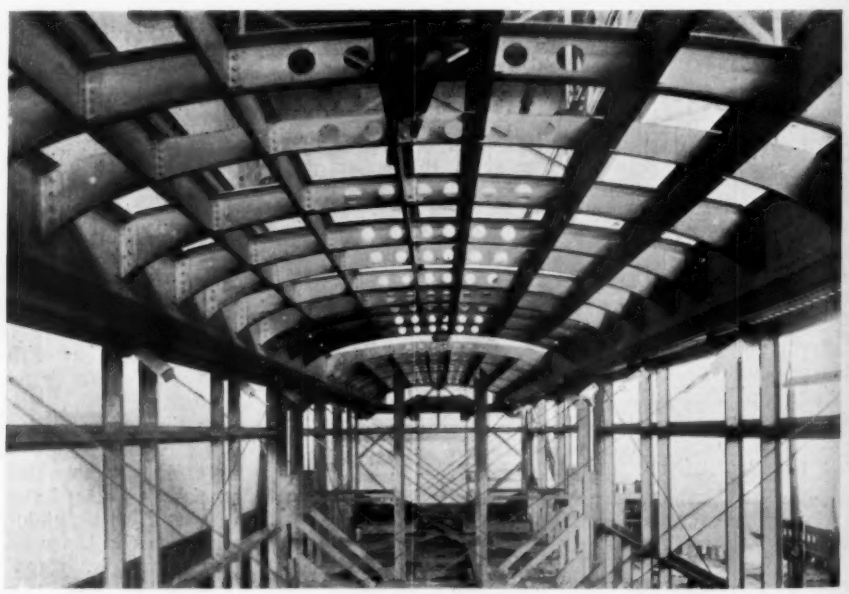
A three-car articulated train such as The Comet presents rather a complicated system for analysis of the motion caused by disturbances on one of its trucks, if consideration is to be given not only to the forces on one truck and that part of the body immediately above but also to those on the rest of the train. Spring coefficients of the various springs, geometric relations, moments of inertia and the masses of the body and trucks, the friction and vertical flexibility of the side and centre pivot bearings and their damping all influence the behaviour.



Welded steel engine bed to carry one 400 b.h.p. Westinghouse engine

The transmissibility of shocks, *a*, may be defined as the ratio of the disturbance of the car body with the spring suspension to periodic disturbances applied at the unsprung parts. Normally, it is highest near the natural frequency of the spring system. If it is large at this point the operating range should be remote from resonance with rail-joint frequencies or other likely periodic disturbances. This effect can be obtained for the lateral motion of the body by making the swing links long enough to lower the natural frequency of this motion beneath the normal operating speed range and leaving a small degree of transmissibility at higher speeds.

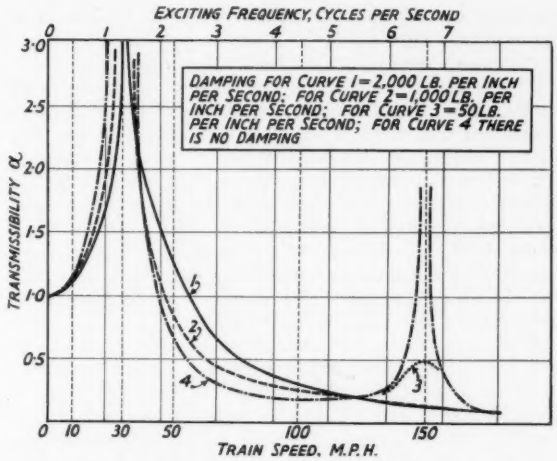
The situation is different where two masses are interconnected by springs, as with the truck frame resting on the journal springs in combination with the car body which



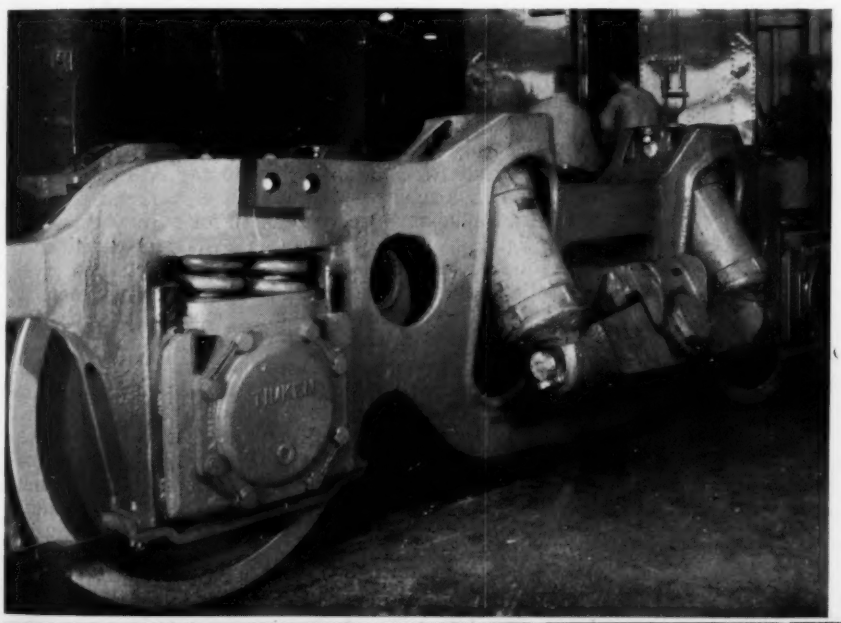
View of car structure, showing roof carlines of the 800 b.h.p. diesel-electric streamlined train, The Comet, of the New York, New Haven & Hartford Railroad

is again spring-supported from the truck frames. Curves formed by plotting values of *a*, the transmissibility, against those of *w*, the exciting frequency in cycles per second or train speed in m.p.h., for The Comet under different conditions of damping are shown in the adjacent illustration. These curves show two peaks which coincide with the natural frequencies of the system. The normal operating speed is above the first and more prominent peak and The Comet passes through it only during acceleration and deceleration. Moreover, at this critical speed the actual disturbances are small and the passengers feel little inconvenience. The second peak is above the possible operating speeds; it is influenced by the spring constant of the journal springs and by the truck mass. A light truck moves the critical range higher and reduces the amount of transmissibility. Softer journal springs reduce the transmissibility and lower the frequency, and in The Comet the truck frame weight has been reduced and the journal springs made as resilient as possible without coming into the critical range or permitting too much roll.

As it is impossible to eliminate friction in actual suspension systems incorporating hydraulic shock absorbers, the damping forces do not vary as the square of the oscillatory velocities but to something less. In The Comet friction has been kept as low as possible by the use of special bushings and bearing materials. The hydraulic

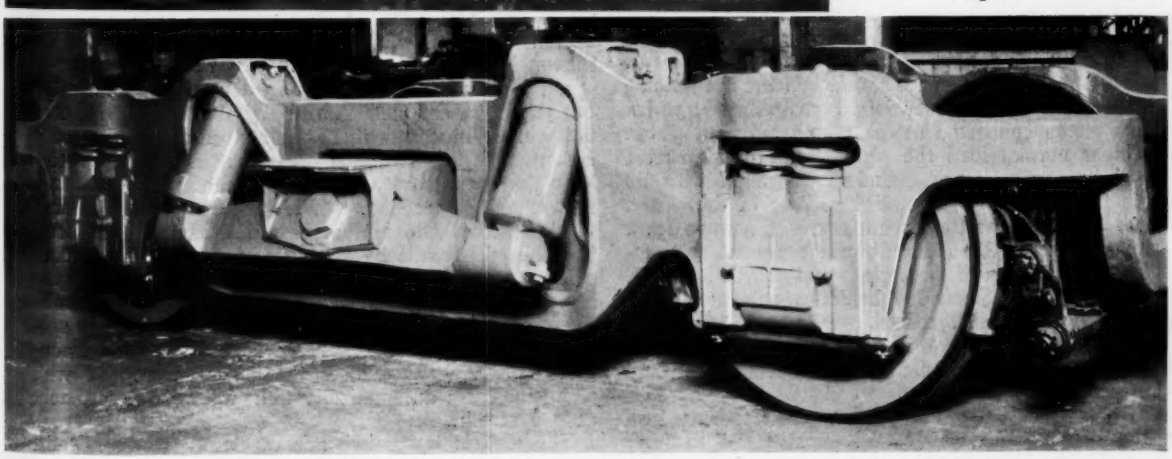


Graph showing damping and transmissibility of the spring suspension of The Comet



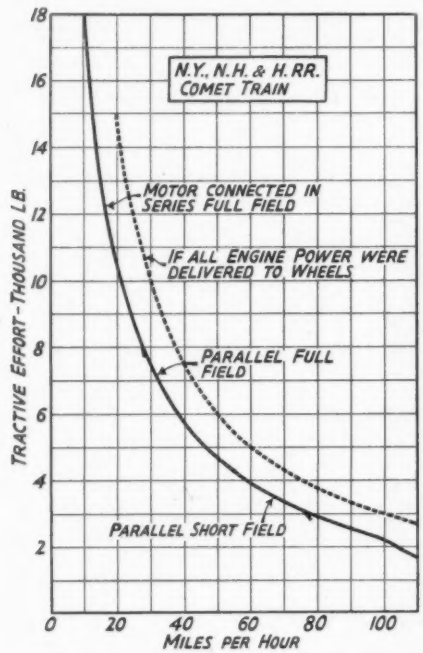
Left : Power truck of The Comet showing the hydraulic shock absorbers and Timken roller bearings

Below : Articulation bogie of The Comet ; it has a wheelbase of 8 ft. 8 in., or 5 in. longer than that of the power truck



shock absorbers of The Comet are adjusted to furnish a strong damping force on the rebound but with little damping opposition to the first action of the springs.

The trucks have a relatively long wheelbase in order to prevent hunting. Two pairs of concentric helical springs are mounted above each of the Timken roller bearing axleboxes, and they have thick rubber pads above and below. Running experience has shown that the truck flexibility lost by the elimination of the normal equaliser has been compensated by other equalising means provided in the bolster suspension. The unsprung weight is less due to the absence of the unsprung equaliser, and the periodic nosing tendency of the truck is so high that resonance with the rail joints is impossible. One-piece cast nickel-steel frames are used in The Comet trucks, and on account of their importance in relation to the suspension and to the train as a whole the design was carefully stress-analysed in order that the material might be used to the best advantage. They were tested with a 100 per cent. overload and deflections and stresses measured at the key points. All the axle assemblies were dynamically balanced before installation.



Tractive effort-speed diagram of the 800 b.h.p. Comet diesel-electric train of the New York, New Haven & Hartford Railroad

The cast steel bolsters are supported at both ends by equalisers hung from the truck frame by four hydraulic shock absorbers, two at each side, which replace the swing links and laminated springs of the conventional American truck. The shock absorbers are hollow cylinders containing flexible helical springs, under initial compression, which rest on a piston connected at the upper end to a piston rod. Under normal load the piston floats at about the centre of its stroke. The cylinders are filled with oil which is forced through regulating orifices in the piston whenever that member travels under a variation in load. The slope at which the shock absorbers are set compensates for the deflection of the springs and prevents rolling. Rubber cushions are provided behind the bolster guide plates and on the truck centres, which are located as low as was found practicable in order to reduce the weight transfer from one axle to another during acceleration and braking periods.

Clasp brakes with two cylinders per truck are used on both the driving and articulation bogies, and to keep the brake shoe pressure low on the driving trucks four shoes per wheel are used. The air brake system is fitted with deceleration control to reduce the braking force with decrease in speeds, and the self-lapping brake valve gives the driver adequate control. The train cannot start until the air reservoir pressure is built up, and a dead-man handle equipment is incorporated in the control. An emergency application of the brakes automatically turns off the engines to idling speed. The brakes cannot be released unless all the doors and folding-in door steps are closed. These steps cannot be closed while a person is on them, and the doors cannot be opened when the train is running at a speed greater than 5 m.p.h.

Electric Transmission

Two duplicate power plants are installed in The Comet, one at each end of the train, and the engine room arrangements, too, are duplicated, except that the single storage battery is installed in one of them and the oil-fired boiler for train heating in the other. Each six-cylinder 400 b.h.p. Westinghouse engine runs at 900 r.p.m. at full load and is rigidly coupled to a d.c. generator which carries an auxiliary generator on an extension of the main armature shaft. The main generator has a maximum voltage of 790, and the voltage varies between that figure and 775 volts up to an amperage of 340; above that point the voltage drops to 400 at a maximum of 650 amp. Over the second part of the full range the generator efficiency varies from 92 to 89 per cent. This main generator has a separately-excited winding for voltage control, a series winding for engine starting, and a commutating field winding. The auxiliary generator has no bearings, its armature being carried on an extension of the main generator shaft and the field frame being bolted to the bearing bracket of the main machine. This auxiliary generator supplies current at a nominal voltage of 110 for battery charging, train lighting, brake compressor motor, air-conditioner operation, cooling-fan motors, and main generator field excitation, and the normal load of each auxiliary generator is about 18 kW. plus the power required by the air-conditioning motors and fans.

Two series traction motors of the usual nose-suspended type are mounted on each of the two end trucks of the train. The gear ratio is 24 : 47 and with the wheels 36-in. diameter as when new, the four motors give the tractive effort shown in the accompanying diagram. Each two motors are grouped successively in series, parallel, and parallel with weak field. From the speed-tractive effort diagram it will be noted that above 100 m.p.h. the available tractive effort falls sharply, this being due to the fact the generator voltage has reached its maximum at that speed and that above it the traction motor voltage is constant. From the start of the train the motors are connected first in series across their respective generators with the engine idling at about 400 r.p.m., then the engine speed is brought up gradually to full revolutions. This operation is conducted with relatively low generator voltage. With the engine at full speed the voltage of the generator is raised automatically at a gradual rate to keep the engines fully loaded until the maximum generator voltage is reached. With the maximum generator voltage across two motors in series, further advance in train speed is made by a transition to parallel connection of the motors, thus reducing the generator voltage to approximately half the maximum value; with the subsequent gradual increase to full voltage again the train speed increases further. Finally, the shunting of the traction motor fields again reduces the generator voltage which again increases automatically until full voltage is reached at 100 m.p.h.

The electric transmission is regulated on the Westing-

house torque control system, the main circuits of which for one power plant are shown in one of the diagrams reproduced. The application of traction power is governed by the movement of a control lever located in each driving position, and the motor groupings are selected by the same lever. A second lever controls the direction of movement by the remote control of reversing drums which reverse the direction of the current flow through the traction motor fields.

The variable voltage regulation of the generator required to prevent overloading of the engine under widely differing current demands of the traction motors, is obtained by a sensitive relay which is responsive to slight variations in the engine speed. The engine is started by closing contactors G1 and GII; power then flows from the battery through the main generator armature and starting field causing the generator to act as a motor. With the engine

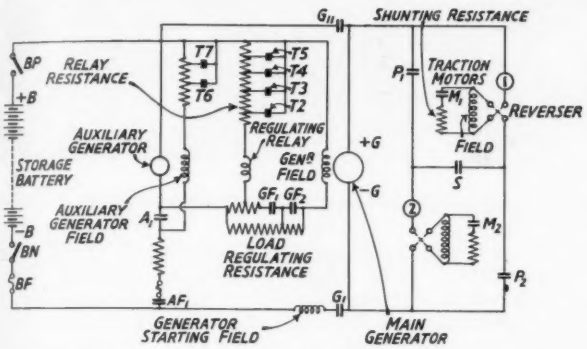


Diagram of main circuits of Westinghouse torque control

firing, power is applied to the traction motors by closing switch S for series connections of the traction motors, or switches P1 and P2 for parallel connection. Contactor AF1 is also closed to energise the auxiliary generator field from the battery, and this generator then develops a voltage for supplying excitation current for the main generator field; the excitation current flows through the load regulating resistance.

Step-by-step advance of the engine speed is maintained by an operator which resets the engine governor for higher speed, but actually this operator controls the engine speed only when the engine is idling, the correct engine speeds being maintained automatically slightly below the governor speed setting by variation of the generator load to hold the engine down to the selected speed, which is accomplished by varying the main generator field through the regulating relay. With the auxiliary generator field excited from the battery, its voltage is directly proportional to the engine speed, but as soon as that speed is raised by the operation of the driving controller the auxiliary generator voltage rises to a point where it is sufficient to operate the regulating relay. When the relay closes its contacts the field regulating contactors *GF1* and *GF2* close to reduce the resistance in the main generator field circuit, resulting in a higher main generator field and voltage and an increase in the traction motor current.

To raise the engine speed to the next higher setting the contact *T2* is opened by the engine governor operator, which inserts additional resistance in the relay circuit and keeps the relay and regulating contactors open. Thus, with minimum generator field and load the engine speed advances rapidly until the auxiliary generator voltage reaches a new value high enough again to cause the regulating relay to come into action and control the engine speed. This procedure is repeated step by step, until the opening of contacts *T6* and *T7* reduces the auxiliary generator voltage from the maximum it has attained. This reduction has the same effect on the regulating relay as the insertion of a resistance in its circuit, thus unloading the engine to allow its speed to rise until once again the auxiliary generator voltage is back at its maximum.

Auxiliaries

The power supply for the auxiliaries is obtained from the main generator when the engine is idling and from the auxiliary generator when the main generator is delivering traction current. The auxiliary requirements of The Comet are heavy and the items requiring power include, in addition to the control system, the following:—

Storage battery.
Two brake compressor motors.
Two air-conditioning compressor motors.
Twelve air-conditioning fan motors.
Two engine fuel pump motors.
Four radiator fan motors.
One blower motor for train heating boiler.
Two regulated lighting systems.

Exclusive of the headlights and vertical beam searchlights, the lighting load amounts to about 8·3 kW. The lighting in the passenger saloons is of the indirect type designed to give a light intensity of 8-ft. candles on a 45-deg. plane 33 in. above floor level. Much of the auxiliary equipment is located in the two engine rooms. Above the main generator is the engine cooling water tank and the transmission control box; the radiators and their motor-driven fans are located on each side panel to the inner end of the engine room, with a brake compressor under one fan housing and an air-conditioning compressor under the other. The air brake equipment is in one of the forward corners.

AMERICAN ACTIVITY. — The New Orleans Public Belt Railroad has ordered three 900 b.h.p. double-bogie diesel-electric locomotives from the Baldwin Locomotive Works, and the Missouri Pacific is enquiring for six diesel-electric switchers.

LEIPZIG TRADE FAIR.—At this year's exhibition the Deutsche Werke, Kiel, is showing diesel engines of several sizes and also a 200 b.h.p. diesel-mechanical locomotive of the same general type as that described in the issue of this Supplement for June 15, 1934.

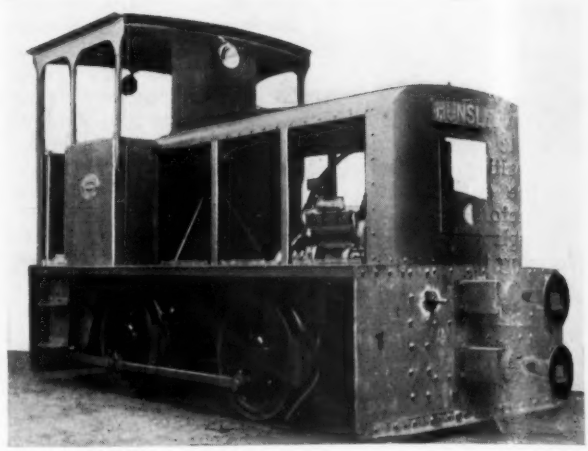
FURTHER ITALIAN EXTENSION.—A diesel railcar service has begun on the Naples-Cancello-Benevento line of the Sovvenzionate private railway. The distance of 42 miles is now covered in 55 min. compared with the 110 min. of the previous steam trains. From the start at Naples the line rises 930 ft. in 26·5 miles. The cars are of the bogie type and are powered by one bogie-mounted M.A.N. engine of 210 b.h.p. operating in conjunction with T.A.G. mechanical transmission. The mechanical portions were built by the Off. Mech., of Padua.

RAILCARS ON THE ITALIAN STATE RAILWAYS.—The daily railcar mileage operated on the Italian State Railways has risen from 2,000 km. (1,240 miles) at the end of 1933 to 50,000 km. (31,000 miles) at the end of 1936. According to the present programme the daily mileage will have risen to 70,000 km. (43,500 miles) by October of the present year. There are 487 railcars of diesel and petrol types in service or under construction, this total including the nine triple-car Fiat diesel trains. All designs have bogie-mounted engines. The repair methods are based on the kilometrage covered and the bogies run from 100,000 to 250,000 km. (62,000 to 155,000 miles) according to the type, before being sent to the central depot at Florence for general overhaul.

DIESEL-GEARED LOCOMOTIVE FOR TRINIDAD

ALTHOUGH of small size, a diesel locomotive of standard gauge built recently by the Hunslet Engine Co. Ltd. for service in Trinidad, incorporates some interesting technical features principally as regards the engine and transmission. The engine is of the Perkins type—the first of this make to be applied to traction, and the transmission is the latest development of the Hunslet design.

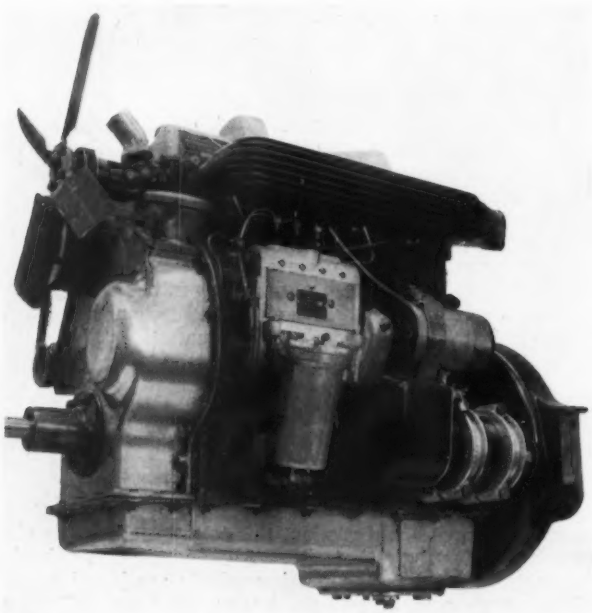
Weighing approximately 9·25 tons in working order, the locomotive is designed to give tractive efforts of 4,900, 2,660, and 1,600 lb. on the three gear steps corresponding to track speeds of 3·25, 6·0, and 10·0 m.p.h. The 33-in. wheels are spread over a base of 5 ft. 6 in., which enables a curve of 60 ft. radius to be negotiated easily. The mechanical portion generally is to ordinary locomotive standards with a heavy plate frame rigidly braced, and with a jackshaft drive located beneath the cab. Assuming a resistance of 18 lb. per ton, the starting and hauling capacity on the first step is over 250 tons on the straight level; on top gear the hauling capacity is about 120 tons. Central buffers and couplings are fitted at two heights to suit wagons of different types. Hand sanding is applied to front and rear wheels. Braking is effected only on the hand screw system, by means of a horizontal hand-wheel in the cab. Electric head, tail and cab lights are fitted.



Hunslet shunter for the West Indies

Engine and Transmission

The Perkins engine is of the Leopard II type with four cylinders 105 mm. by 127 mm. (4·14 in. by 5·0 in.). For railway work the continuous output is 50 b.h.p. at 1,500 r.p.m., giving a brake m.e.p. in excess of 100 lb. per sq. in. and a fuel consumption of about 0·4 lb. per b.h.p.hr. The overload capacity is 55 b.h.p. at the same rotational speed, but for road work the same engine is run up to a maximum of 75 b.h.p. at 2,400 r.p.m. Complete with starting equipment the engine weighs about 13 lb. per b.h.p. The cylinder block and crankcase are cast integrally and the four cylinder heads are cast in one piece; the heads embody the Aeroflow type of air cell, in which the fuel is dual-sprayed from a point in the transfer passage simultaneously towards the air cell in two jets and to the combustion chamber proper in one jet. C.A.V.-Bosch fuel pumps are used. Both electric and hand starting are incorporated, the latter being considered more as an auxiliary. The engine is mounted on the locomotive frame through the intermediary of rubber blocks. The cooling system incorporates a radiator with Serck sectional elements and with welded steel headers, and is thermostatically controlled. C.A.V.-Bosch and Tecalemit filters are inserted in the lubricating oil circuit.



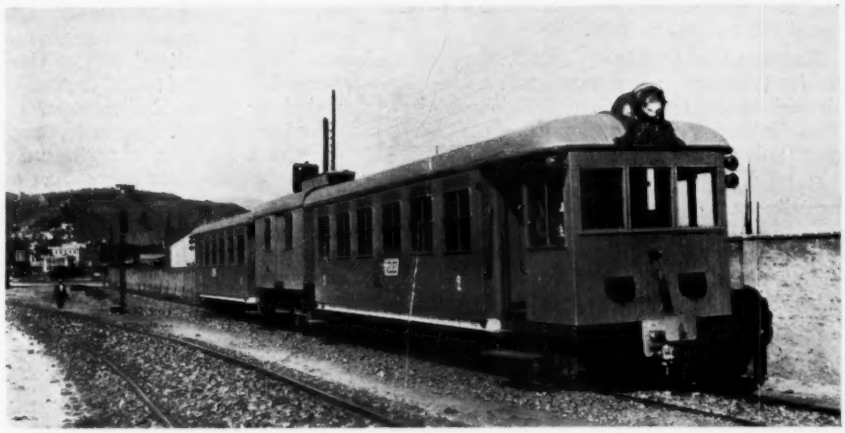
Perkins Leopard II engine rated at 50 b.h.p. for railway work

The engine cylinder block and crankcase are cast in one piece of chromium cast iron, to the bottom of which is attached a light metal sump. The four cylinder heads are in the form of an integral casting of chromium iron, and by the incorporation of the Perkins patented valve gear, this casting can be lifted off without disturbing the timing case. The crankshaft and connecting rods are of nickel-chrome-molybdenum steel, and have lead-bronze main and big-end bearings. The camshaft, fuel pump and idling governor are driven by one continuous triple roller chain, and the camshaft is located high up just beneath the cylinder heads.

A Hunslet patent gearbox and clutch form the main constituents of the transmission. The single-plate clutch is located immediately behind the engine, and thence a shaft leads to a Hardy-Spicer coupling close to the gearbox, which is arranged beneath the cab floor. The box itself is of welded steel and carries ball and roller bearings for all the shafts. From the gearbox the drive is led through the reversing gears to a jackshaft, which is carried on roller bearings, and transmits the torque to the wheels through short rods. Gear-changing operations by the driver are through Hunslet patent " easy-change " clutches with interlocking mechanism to prevent absolutely the possibility of more than one gear being engaged at the same time.

DIESEL-WORKED SUBURBAN TRAFFIC IN SPAIN

Heavy peak traffic has been operated by a three-car train for over six years



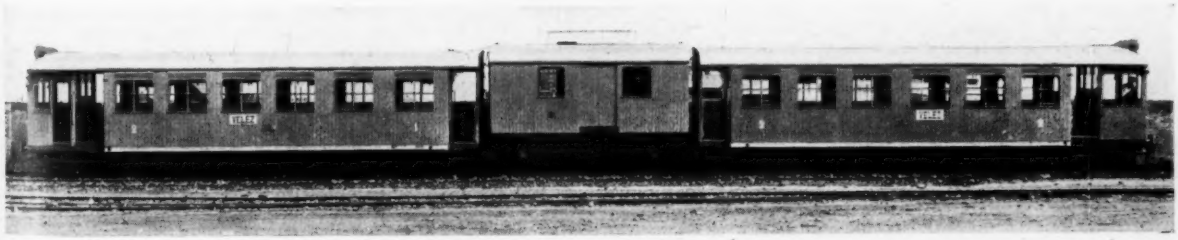
First and second class diesel train of the Malaga suburban lines

THE Malaga Suburban Railways built in their own shops in 1930 a three-car diesel-mechanical train for operating passenger traffic to a bathing station situated about two miles from the Malaga terminus, and to aviation meetings at a distance of six miles from the city, as well as to run certain services on the Velez line over a route mileage of 22, which distance is covered in 67 min. inclusive of 18 stops, or in 45 min. non-stop.

All the power and transmission equipment is located on the short centre vehicle. The engine is of high-speed light-weight air injection Maybach type, and has a continuous rating of 150 b.h.p. at 1,300 r.p.m. The engine controls from the driving cabins at each end of the train are transmitted to the mechanism on the centre vehicle by steel cables running on pulleys, in the manner utilised on other Maybach-engined railcars. The four wheels, one metre in diameter, which support the centre vehicle are all driving, and from the chassis of this vehicle are projected two pony trucks to support the inner ends of the passenger cars. The driving wheels are spread over a base of 11 ft. 6 in. and are driven by shafts from the Maybach gearbox. The torque is transmitted to the wheels through a jackshaft and rods. Either the car itself or the engine alone can be started by admitting compressed air to the engine cylinders for the first few revolutions, and the air bottles and compressor are of a capacity sufficient to enable the car to be started by air regularly. The radiator fan and dynamo are driven from a transverse shaft operated from the primary shaft of the gearbox, which is a prolongation of the engine shaft. The fuel tanks (with a total capacity of 44 gal.) and the silencer are located within the centre cab.

Each passenger coach has a driving compartment at the outer end. The construction of the whole train is very robust, largely on account of frequent overloading at rush hours, the number of passengers carried often rising to over 200 per cent. of the seating capacity. One of the end vehicles was converted from an old passenger car. Westinghouse brakes are fitted, but actuate blocks on drums attached to all the bogie wheels and to two of the driving wheels. The lighting is electric and is worked from a 1·5 kW. generator operated in conjunction with a 140 amp.-hr. Tudor battery. The complete train extends over a length of 101 ft. 6 in. and tares 42·45 tons; with all seats occupied the weight is 49·5 tons. The top speed is about 70 km.p.h. (43 m.p.h.).

From going into service in 1930 until the end of December, 1935, this diesel train had covered 162,000 km. Over this distance the fuel consumption averaged 57·76 kg. per 100 km. (2·05 lb. per mile); the engine lubricating oil 2·903 kg. per 100 km. (0·1025 lb. per mile); and other lubricating oil for motive power and mechanical portion 1·72 kg. per 100 km. (0·061 lb. per 100 miles). The engine and transmission gave some trouble at the beginning. The key of the driving shaft of the gearbox broke, and led not only to immediate trouble but also to defects through overstrain which came to light later. Three connecting rod breakages occurred, and eventually the engine was returned to the maker for thorough overhaul and certain modifications. At this time the original cast iron pistons were replaced by others of aluminium alloy with a slightly different shape of crown. Since that time little trouble has been experienced and the train has given excellent service.



The 150 b.h.p. three-car Maybach-engined train in use at Malaga

NOTES AND NEWS

South American Enquiry.—The Uruguayan State Railways, which placed an order for three vehicles in the U.S.A. during 1936, is enquiring for several single and double-unit diesel railcars.

Roumanian Order.—Ganz & Co., of Budapest, has received an order for three 240-b.h.p. Ganz-Jendrassik oil engines and three sets of Ganz mechanical transmission from Malaxa, for installation in railcars being built for the Roumanian State Railways.

Cylinder Hardening.—A new chrome-hardening process for cylinder walls or liners has been evolved by R. A. Lister & Co. Ltd. It consists of the deposition by a means not revealed of a layer of chromium on to the wearing surface, and comparative tests with certain non-hardened cylinders have shown an increase of 300 per cent. in the wear of " Listard " cylinders.

Cooling Water Radiator.—Among the exhibits of the Spiral Tube & Components Co. Ltd. at the British Industries Fair is a standard radiator of the type used on diesel

Cooling water radiator for diesel locomotives and railcars. It is of the Spiral Tube standard T type

locomotives and railcars, and as illustrated on this page. They are made in ten sizes suitable for engines up to 150 b.h.p., and have copper tubes.

British Diesel Mail Service.—According to a paper read by Mr. J. H. Brebner, Controller of Press, Information, and Publications, G.P.O., the considerable improvements now being effected in the mail service in west and south-west England are to be assisted by a diesel railcar service between Reading and Basingstoke on the G.W.R., which is to be worked by one of the 260 b.h.p. A.E.C. railcars.

Danish Extension.—The Danish State Railways has ordered from A/S Frichs eight double-bogie diesel-electric railcars of 500/550 b.h.p. Including spare bogies, the order is valued at 2·4 million kroner, and delivery is to be effected by April, 1938. These cars will have one six-wheeled bogie carrying the power plant and one four-wheeled bogie driven by two electric traction motors. The power is to be provided by two 250/275 b.h.p. engines set side by side. Multiple-unit control is to be fitted.

Diesels for Iran.—The Iranian Government Railways have placed an order for two diesel-electric railcars with Nydquist & Holm A.B., of Trollhättan, Sweden. They are for the standard gauge and will operate at speeds up to 45 m.p.h. and at altitudes up to 6,900 ft. above sea level. Each car will be carried on one six-wheeled and one four-wheeled bogie ; on the former will be mounted a Burmeister & Wain two-stroke engine developing 330 b.h.p. at 1,100 r.p.m. and a d.c. main generator. The four-wheeled bogie is to be driven by two traction motors. All the electrical equipment will be of Asea manufacture.

Hungarian Railcar Costs.—According to the report on heavy oil engine working costs (1935/1936) issued by the Diesel Engine Users' Association, the average working cost of the 97 Ganz diesel railcars at work on the Hungarian State Railways for the year ending June 30, 1936, was 2·46d. per mile, exclusive of financial charges. Maintenance charges amounted only to 0·446d. per mile. The cars covered an aggregate mileage of 2,666,525 in the annual period. Of the total number of cars, 88 are of 120 b.h.p. with four or six wheels.

Baume-Marpent Bogies

When describing in our issue of October 2, 1936, the Belgian streamlined trains built by the S.A. Baume-Marpent, of Haine St. Pierre, we stated, on pages 558-9, that the bogies carrying the engines were of the Wumag type. The S.A. Baume-Marpent inform us that this statement is incorrect, and that the bogies in question are entirely to their own designs and on their own principles, and that no parts of the bogies are covered by Wumag patents.

Publication Received

Diesel Engine Design. Fourth Edition. By H. F. P. Purday. London : Constable & Co. Ltd., 10-12, Orange Street, W.C.2. $8\frac{7}{8}$ in. × $5\frac{5}{8}$ in. × $1\frac{1}{2}$ in. 520 pp. Illustrated. Price 24s. 0d. net.—This book, well-known for many years, has always been what it set out to be and has always fulfilled what was claimed for it in the title. If this latest edition is not as different as chalk is from cheese compared with the previous editions, it is at least as good as another volume by reason of the extensive re-writing and additional material. The practical railway officer with oil-engined vehicles in his charge may consider this work too theoretical and of rather academic interest, but to such men it is not addressed. Essentially is it suited to the needs of the designer, draughtsman and manufacturer, and not so much to a student, for it contains just that information which cannot be taught to or absorbed by a college student or an apprentice, but which must be acquired as speedily and as thoroughly as possible when those halcyon days are over. Within 24 chapters is covered the gamut of diesel-engine design, and by giving up the idea of an even larger book divided into separate sections on the various types—two-stroke, high-speed, marine and the like—the author has been able to include some notes on them all without any repetition or without necessitating constant reference to other chapters. Within the diesel field—itself highly specialised—this book therefore is fundamental rather than specialised, and the principle of similitude which the author has adopted for a number of problems will be recognized by discerning readers as needing great care in its use, for the range of engines is now exceedingly large and the duties most variable. Crankshafts, torsional vibrations and supercharging are given just the right amount of treatment ; the design of all the moving parts and the injection equipment receive attention ; and the air and exhaust systems, temperature stresses, framework, cylinders, and cooling water systems have chapters to themselves. Finally, the 342 line diagrams are clearly reproduced, and the mathematics are set up in such a way as to ensure the minimum of misunderstanding.